Portsmouth Water

OUR WATER RESOURCES MANAGEMENT PLAN 2025-2075

Technical Report
October 2024

Final Water Resources Management Plan 2024

Final Water Resources Management Plan 2024 Compliance Statement:

In accordance with Section 37B(8)(a) of the Water Industry Act 1991 Portsmouth Water have published a Final Water Resources Management Plan. This plan does not contain any commercially confidential material and there have been no redactions as a result.

The original plan did contain information that the Secretary of State may consider to be contrary to the interests of national security and this has been redacted. This information related to abstraction licence and asset names, which have been replaced by generic titles, and locations which have been removed.

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October 2024

LIST OF FIGURES

LIST OF TABLES

GLOSSARY

Acronym or term		Definition
1-in-200		Refers to a drought with a 1-in-200 chance of happening in any single year.
1-in-500		Refers to a drought with a 1-in-500 chance of happening in any single year.
Abstraction		The removal of water from the environment, either permanently or temporarily.
Abstraction licence		The authorisation granted by the Environment Agency to allow the removal of water from a source.
Adaptive plan		A framework which allows water companies to consider multiple preferred programmes or options. An adaptive plan should set out how decisions will be made within the framework.
ADO	Average deployable output	The annual average daily deployable output of a source/treatment works or a group of sources/treatment works (the average daily DO, in million litres a day, or Ml/d, over a year).
AR	Annual return	The annual return of data submitted to the Environment Agency by all water companies in England.
AIC	Average Incremental Cost	A financial term used to calculate the cost benefit of an option over the life of the planning period. An AIC value has been calculated for each option considered so that options of different scales, lifetimes and type can be objectively compared to inform decision-making about what is the most cost-effective water to balance supply and demand for water over the long term.
Available headroom		The difference (in Ml/d or percent) between water available for use (including imported water) and demand at any given point in time.
Base year		A selected year before the beginning of the planning horizon which forms the basis for the water demand and supply forecasting of subsequent years. The base year should be based on actual data, adjusted to the relevant planning scenario as appropriate (e.g. Dry Year Annual Average).
Baseline forecast/scenario		A forecast which reflects a company's supply and demand situation without any further interventions from the company.
BAU	Business as usual	The system currently in place for a company prior to implementing changes to increase efficiency.
BVP	Best value plan	A best value plan is one that considers factors alongside economic cost and seeks to achieve an outcome that increases the overall benefit to customers, the wider environment and overall society.
BNG	Biodiversity net gain	Measurable improvements for biodiversity by creating or enhancing habitats in association with development. An approach used to improve a sites biodiversity value, with the application of biodiversity net gain leaving a positive ecological impact and delivering environmental enhancements/mitigation.
CAPEX	Capital expenditure	Capex is a contraction of the term capital expenditure. The term refers to investment in long term physical or fixed assets.

Acronym or term		Definition
CCW	Consumer Council for Water	The Consumer Council for Water is the independent representative of household and business water consumers in England and Wales.
CO_2	Carbon dioxide	A heat trapping greenhouse gas.
Demand management		The implementation of policies or measures which serve to control or influence the consumption or waste of water (this definition can be applied at any point along the chain of supply).
Design event		The drought event on which the supply assumptions in a plan are based on.
DI	Distribution input	The amount of water entering the distribution system at the point of production. This is usually measured by a flow meter on a pipe as water leaves a water treatment works.
Distribution losses		Made up of losses on trunk mains, service reservoirs, distribution mains and communication pipes. Distribution losses are distribution input less water taken.
DO	Deployable output	The output of a commissioned source or group of sources or of bulk supply as constrained by hydrological yield, licensed quantities, environment (represented through licence constraints), pumping plant and well/aquifer properties, raw water mains and aqueducts, transfer and output main, treatment and water quality.
Drought order		An authorisation granted by the Secretary of State under drought conditions, which imposes restrictions upon the use of water and/or allows for abstraction/impoundment outside the schedule of existing licences on a temporary basis.
Drought permit		An authorisation granted by the Environment Agency under drought conditions, which allows for abstraction/impoundment outside the schedule of existing licences on a temporary basis.
Dry year annual average unrestricted daily demand		The level of demand, which is just equal to the maximum annual average, which can be met at any time during the year without the introduction of demand restrictions. This should be based on a continuation of current demand management policies. The dry year demand should be expressed as the total demand in the year divided by the number of days in the year.
DSOU	Distribution system operational use	Water knowingly used by a company to meet its statutory obligations particularly those relating to water quality. Examples include mains flushing and air scouring. For example, water run to waste such as that used for the purpose of mains flushing.
DWI	Drinking Water Inspectorate	The government body that regulates the quality of drinking water.
dWRMP	draft Water Resource management plan	A draft statutory 25-year plan that all water companies in England & Wales are required to update, publish and consult on every five years. The plans show how companies intend to secure water supplies for current and future customers, at least cost to customers, society and the environment, while meeting all other environmental obligations.
DWSP	Drinking Water Safety Plan	A plan to verify that the World Health Organisation and drinking water safety plan process has been followed and is in line with regulations to ensure drinking water safety.

Acronym or term		Definition
DYAA	Dry year annual average	The annual average value of water demand, deployable output or some other quantity over the course of a dry year.
DYCP	Dry year critical period	Typically, the time in a dry year when demand is greatest, often termed the peak week. Also commonly known as the summer peak period.
EFI	Environmental flow indicators	Percentage deviation from the natural river flow represented by a flow duration curve, which determines the ecological sensitivity to changes in river flow.
EIP	Environmental Improvement Plan	In January 2023 the Government published its Environmental Improvement Plan. This is the first revision of the 25-year Environment Plan.
Feasible option		An option that is considered suitable to assess for inclusion in the preferred programme of options. I.e. it should have no unacceptable planning or environmental constraints.
Final planning forecast		A forecast, which reflects a company's preferred policy for managing demand and resources through the planning period, after taking account of all options through full economic analysis.
Final planning forecast/scenario		A forecast which reflects a company's supply and demand situation with its preferred options in place.
GCM	Global climate models	Complex mathematical representation of the major climate system components (atmosphere, land surface, ocean, and sea ice), and their interactions. Earth's energy balance between the four components is the key to long-term climate prediction.
GHG	Greenhouse gas	Greenhouse gas is a gas that absorbs and emits radiant energy within the thermal infrared range, causing the greenhouse effect. This contributes to global warming.
GIS	Geographical information system	System that creates, manages, analyses, and maps all types of data. GIS connects data to a map, integrating location data (where things are) with all types of descriptive information (what things are like there).
h-plan/ housing plan	Housing Plan	Housing Plan based projections. These housing plan forecasts take account of areas or sites where housing is identified for delivery in the future, not just where it currently exists.
HRA	Habitat Regulations Assessment	An assessment of the potential impacts on designated sites of the measures or interventions we are proposing in our plan; it also assesses how effective any mitigation measures are in reducing the impact on designated sites.
HSE	Hampshire Southampton East zone	This is a water resources zone in Southern Water's supply area.
INNS	Invasive non-native species	A non-native species is one that did not originate in the given habitat, with the potential to have a positive or negative effect on the ecosystem.
l/h/d	Litres per head per day	The average amount of water used per person each day.
l/prop/ d	Litres per property per day	The average amount of water used per property each day.
LHN	Local housing need	Housing need is described as when a household whose housing falls below at least one of the standards of Affordability, Suitability and Adequacy.

Acronym or term		Definition
LoS	Levels of Service	The frequency with which we can impose different types of water restrictions during water shortages (and which are supported by our customers).
Meter optants		Properties in which a meter is voluntarily installed at the request of its occupants.
mg/l	Milligrams per litre	Metric to measure water quality.
Micro-component analysis		The process of deriving estimates of future consumption based on expected changes in the individual components of customer use.
Ml/d	Megalitres per day	Metric to measure water volume.
MLR	Multi-linear regression	Multiple linear regression (MLR), also known as multiple regression, is a statistical technique that uses several explanatory variables to predict the outcome of a response variable.
NAV	New appointments and variation companies	New appointments and variations (NAVs) are limited companies which provide a water and/or sewerage service to customers in an area which was previously provided by the incumbent monopoly provider. A new appointment is made when a limited company is appointed by Ofwat to provide water and/or sewerage services for a specific geographic area.
NC	Natural capital	The elements of nature that either directly or indirectly provide value to people e.g. soil provides the means for growing crops.
NPV	Net Present Value	The difference between the discounted sum of all the benefits arising from a project and the discounted sum of all the costs arising from the project.
NEUBs	Non-essential use bans	A restriction placed on water usage during drought conditions, which has more impact on the businesses in the local area.
NHH	Non-household	Properties receiving potable supplies that are not occupied as domestic premises, for example, factories, offices and commercial premises. They also include properties containing multiple households, which receive a single bill (for example, blocks of flats).
NIC	National infrastructure commission	The UK National Infrastructure Commission is the executive agency responsible for providing expert advice to the UK Government on infrastructure challenges facing the UK.
Non-households		Properties receiving potable supplies that are not occupied as domestic premises, for example, factories, offices and commercial premises. They also include properties containing multiple households, which receive a single bill (for example, blocks of flats).
Normal year annual average daily demand		The total demand in a year with normal or average weather patterns, divided by the number of days in the year.
NPP	National population projection	Projections of the future size and age structure of the population of the UK and its constituent countries. Based on mid-year population estimates and assumptions of future fertility, mortality and migration.
NRW	Natural Resources Wales	Welsh government sponsored body ensuring the environment and natural resources of Wales are sustainably maintained and used, now and in the future.

Acronym or term		Definition
NY	Normal year	A year in which temperature and rainfall values are at or close to their long-term average.
NYAA	Normal year annual average	The annual average daily value of water demand, deployable output or some other quantity over the course of a normal year.
OAHN	Objectively Assessed housing need	Total demand or housing, from all types of household and for both affordable and market housing.
OFWAT	Office of Water Services	The independent economic regulator for the water industry.
OMT	Outage modelling tool	A tool to model the temporary loss of reliable water (see deployable output) due to planned or unplanned events. Examples of planned events include where we need to carry out maintenance of our water sources; an example of unplanned events are where there are power cuts or failures in our treatment processes.
ONS	Office for National Statistics	The UK's largest independent producer of official statistics and the recognised national statistical institute of the UK.
OPEX	Operating costs	Our day-to-day operating costs.
Option		A scheme which can provide water to a company either through reduction in customer or business demand, or increasing supply, or transferring water from outside the resource zone. An option should increase water availability in some part of the supply-demand balance.
Outage		A temporary and unplanned loss of deployable output. Common reasons for outages include assets failing, and power cuts.
OxCAM	The Oxford–Cambridge Arc	The Oxford to Cambridge (OxCam) Arc is the name given to a cross-government initiative that supports planning for the future of the five ceremonial counties of Oxfordshire, Bedfordshire, Buckinghamshire, Cambridgeshire and Northamptonshire up until 2050. The area covers 26 Local Authority Districts extending between Oxford, Milton Keynes and Cambridge.
PCC	Per capita consumption	The water used by a measured or unmeasured property over a given period (litres per property per day, l/prop/d).
PDO	Peak demand deployable output	The average daily deployable output, measured in million litres per day (Ml/d), at the time of peak demand, whether over a period of a week (the peak week), a month (the peak month) or some longer period.
PET	Potential evaporation and transpiration	Potential evapotranspiration or PE is a measure of the ability of the atmosphere to remove water from the surface through the processes of evaporation and transpiration assuming no control on water supply. Actual evapotranspiration or AE is the quantity of water that is removed from a surface due to the processes of evaporation and transpiration.
PHC	Per household consumption	Water consumption per household property to feed into baseline water usage.
Plan		Water resources management plan.
Planning horizon		The period over which the plan is based (e.g. 2025–26 to 2074–75).

Acronym or term		Definition
Potable water exported		Potable water exports from within a defined geographical area to an area outside the defined geographical area.
Potable water imported		Potable water imports from outside a defined geographical area to the defined geographical area.
Potable water produced		Raw water treatment less treatment works operational use and treatment work losses.
Preferred plan		The preferred set of options and actions set out by a company in its water resources management plan.
Programme appraisal		A comparison of different programmes of options against each other to inform and justify the preferred programme.
PyWR	Python for water resources	A flexible and fast processing model used for water resource stochastic data.
RAG	Red, amber, green	An assessment approach for environmental screening with red being negative and green being a more positive outcome.
RAPID	Regulators' Alliance for Progressing Infrastructure Development'	RAPID has been formed to help accelerate the development of new water infrastructure and design future regulatory frameworks. The joint team is made up of the three water regulators Ofwat, Environment Agency and Drinking Water Inspectorate. It will provide a seamless regulatory interface, working with the industry to promote the development of national water resources infrastructure that is in the best interests of water users and the environment.
Raw water losses		The net loss of water to the resource system, comprised of mains/aqueduct (pressure system) losses, open channel/very low pressure system losses, and losses from break-pressure tanks and small reservoirs.
Raw water operational use		Regular washing-out of mains due to sediment build-up and poor quality of source water.
RCM	Regional climate models	Numerical climate prediction model.
Regional plan		A regional plan is similar to a WRMP, but at a regional level and includes the needs of other sectors including water customers, business, industry, navigation and agriculture will be managed in the region.
Resource zone		The largest possible area in which all resources, including external transfers, can be shared and hence the area in which all customers experience the same risk of supply failure from a resource shortfall.
RSS	Regional system simulator	Model developed using a python-based water resource modelling platform called 'Pywr'. Pywr was selected as the platform for the RSS following a detailed review of available options conducted for WRSE.
Scheme		Used interchangeably with option.
SEA	Strategic Environmental Assessment	An SEA is the process by which we demonstrate how we have incorporated environmental considerations into our policies, plans and programmes of work.
SNPP	Principle sub-national population projection	Based on a five-year history (2013–2018) to derive local fertility and mortality assumptions and a long-term UK net international migration assumption and a two-year history (2016–2018) of internal migration assumptions.

Acronym or term		Definition
Source		A named source of water, where the water is an input to a water resource zone. A multiple well/spring source is a named place where water is abstracted from more than one operational well/spring.
SRO	Strategic Resource Options	SRO's are large infrastructure schemes, that are developed between water companies and with RAPID to ensure water supplies across the network, often in the form of reservoirs and bulk water transfers.
Supply pipe losses		The sum of underground supply pipe losses and above ground supply pipe losses.
Supply-demand balance		The difference between water available for use (including imported water) and demand at any given point in time (c.f. available headroom).
Sustainability reduction		Reductions in deployable output required by the Environment Agency to meet statutory and/or environmental requirements.
SWS	Southern Water Services	Southern Water is the private utility company responsible for the public wastewater collection and treatment in Hampshire, the Isle of Wight, West Sussex, East Sussex and Kent, and for the public water supply and distribution in approximately half of this area.
Target headroom		The threshold of minimum acceptable headroom, which would trigger the need for water management options to increase water available for use or decrease demand.
Total leakage		The sum of distribution losses and underground supply pipe losses.
Treatment work losses		The sum of structural water loss and both continuous and intermittent over-flows.
Treatment work operational use		Treatment process water i.e. net loss, which excludes water returned to source water.
TUBs	Temporary Use Bans	A restriction implemented on water usage during drought/dry weather conditions. This is also known as a 'hosepipe ban'.
UKWIR	United Kingdom Water Industry Research	The collaborative research body of the water companies of England & Wales.
Unconstrained option		An option that could technically be implemented to address the water resources planning problem. It may be subject to unalterable planning or environmental constraints.
Underground supply pipe losses		Losses between the point of delivery and the point of consumption.
Unrestricted demand		The demand for water when there are no restrictions in place (this definition can be applied at any point along the chain of supply).
USPL	Underground supply pipe leakage	Losses on the section of pipework between our distribution system and where water enters a customer's property.
VF	Variable flow	The term 'variable flow' refers to how factors modify fixed future assumptions on 'flows' of water into supply.
Void property		An empty property that is connected to the distribution network but not charged because it has no occupants.

Acronym or term		Definition
WAFU	Water available for use	The overall amount of water that is available to use. This takes account of the water we lose through planned and unplanned events (see outage) sustainability reductions (see sustainability reduction); but also water we transfer out of our supply area to other companies (exports) and water we receive from other companies (imports). The value is calculated by deducting allowable outages and planning allowances from deployable output in a resource zone.
Water delivered		Water delivered to a defined address for people to use. This can be in people's homes but also in non-household properties.
Water delivered billed		Water delivered less water taken unbilled. It can be split into unmeasured household, measured household, unmeasured non-household and measured non-households water delivered.
Water taken		The quantity of water remaining from the water that is put into our supply pipes from water treatment works after 'distribution losses' (such as leakage from pipes) have been subtracted.
WFD	Water Framework Directive	European directive which aims to protect and improve the water environment.
WINEP	Water Industry Environmental Improvement Programme	The programme of environmental measures agreed for action between Government, the Environment Agency, Natural England, Ofwat and the water companies.
WRMP	Water Resource Management Plan	The statutory 25-year plans that all water companies in England & Wales are required to update, publish and consult on every five years. The plans show how companies intend to secure water supplies for current and future customers, at least cost to customers, society and the environment, while meeting all other environmental obligations.
WRP tables		Water resources plan tables used for presenting key quantitative data associated with a water resources plan.
WRPG	Water Resource Planning Guideline	The guidance document published by the Environment Agency, Ofwat, Defra and the Welsh Government to provide advice to water companies on what they should include in their WRMPs. Version 12 FINAL For Publishing updated March 2023
WRSE	Water Resources in the South East	An alliance made up of the six water companies that cover the South East region of England, with an aim to secure the water supply for future generations though a collaborative, regional approach to managing water resources.
WRZ	Water resource zone	The largest possible area in which all resources, including external transfers, can be shared and hence the area in which all customers experience the same risk of supply failure from a resource shortfall.

EXECUTIVE SUMMARY

This plan puts Portsmouth Water at the forefront of water sector initiatives to safeguard the environment, whilst at the same time delivering secure and wholesome drinking water supplies to our domestic and non-household customers. Our Water Resources Management Plan sets out how we plan to supply safe, reliable drinking water for the next 50 years (2025-2075). We have developed it with and for our customers, but also to play our part in delivering the best-value plan for the wider South East, which makes the most of our region's precious water resources, prepares for the future and will improve our natural environment.

All water companies prepare Water Resources Management Plans (WRMPs) which consider how much water is available today, how much we need for the future and develop options to make up the difference. These plans are reviewed every year and updated every five years, to make sure they always reflect the latest situation and especially our customers' needs. Our plan covers the period 2025 to 2075. In November 2022 we consulted on our draft plan and this final WRMP24 reflects our latest plan including changes we have made as a result of the comments we received.

This plan is built on our previous plans, working with our neighbouring companies in the South East to ensure that we meet all the regulatory requirements. Since our WRMP19 there have been significant challenges that we have had to consider, including:

- Changes in behaviour around water use as a result of Covid-19.
- The potential need to reduce or stop altogether abstractions from sources that are environmentally sensitive.
- Accounting for population and housing growth.
- Working together with neighbouring companies to develop a regional plan (Water Resources South East (WRSE)) to meet the requirements of the National Water Resources Framework.
- To meet the requirements of Defra's Environmental Improvement Plan (EIP January 2023) which set demanding demand-side targets.
- Taking account of the risks and uncertainties inherent in planning for at least 25-years ahead
- Recognising that our plan needs to deliver 'best-value' to our customers and for the environment.
- More variable and extreme climatic conditions that affect both the water we have available to supply and the water required for the environment and customer demands.

We have been an active participant in WRSE's technical work and the engagement with regulators and other stakeholders. Outputs from WRSE have been used to inform our company-specific WRMP24 which has been tailored to reflect our customers views and feedback on our draft WRMP24.

This is our most ambitious and most collaborative plan yet. This plan means that the company will become more resilient to increasingly severe drought events, at the same time as reducing our reliance and impact upon the precious chalk-based environment that characterises our supply area.

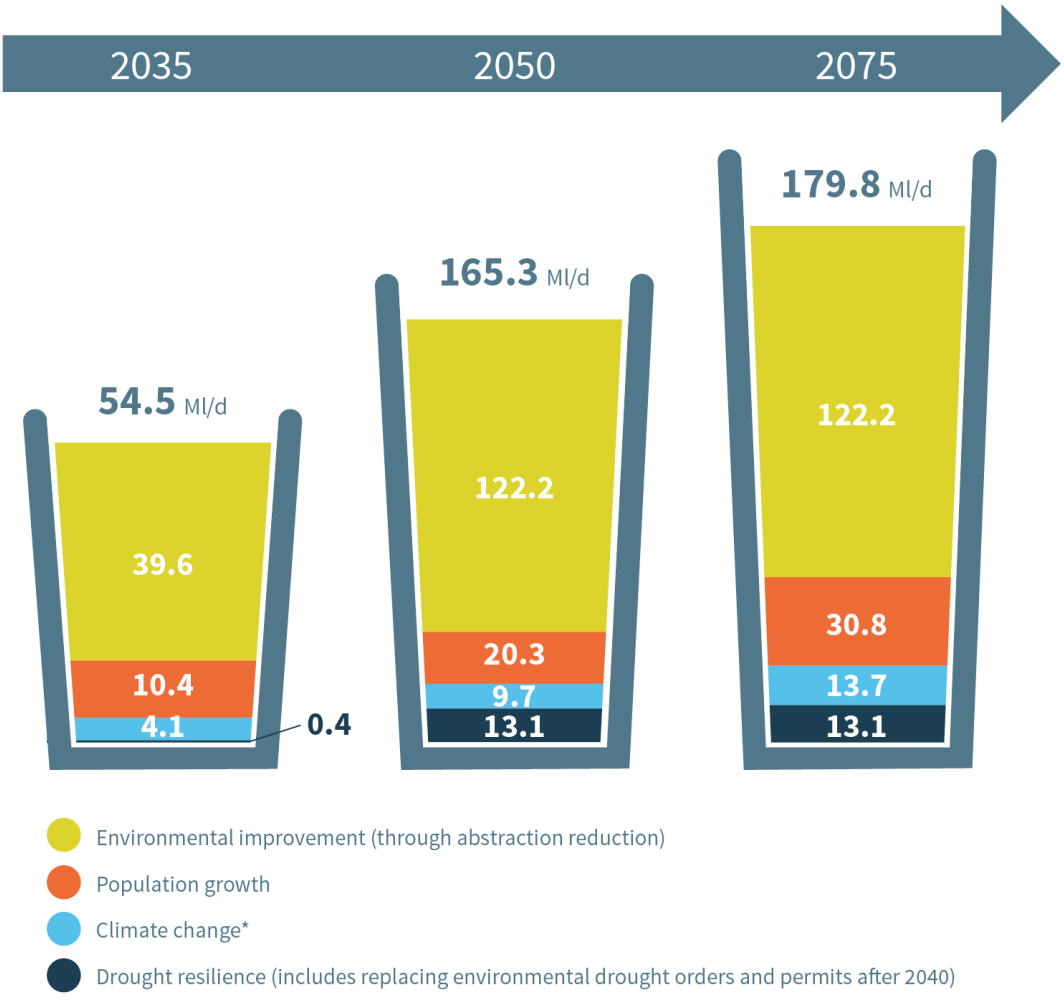
This plan presents the base supply-demand balance throughout the next 50-year planning period (2025–26 to 2074–75). It demonstrates the need for the investment necessary to maintain the balance between supply and demand over that period. It shows how we derived feasible options to either reduce demand for water and/or increase the supply of water. It lays out the programme of actions we are proposing to ensure a reliable and resilient water supply for our customers, our environment and to contribute to the resilience of water resources for the wider South East of England.

This plan demonstrates our commitment to deliver our vision *'Excellence in Water. Always'* by delivering on the following four principles:

- To secure sustainable water supplies for our customers, which protect and enhance our environment in a changing world.
- To be at the frontier of delivering high-quality, resilient, net-zero services for our customers, for the environment and for the region.
- To co-create solutions which deliver our customers', communities' and stakeholders' priorities.
- To always provide affordable water for all.

Our Supply Demand Balance Challenge

Over the planning period, we are forecasting a reduction in the water we have available to supply, primarily related to a reduction in abstraction to meet environmental protection but also due to the effects of climate change. In addition, we are forecasting an increase in demand from a growing population. The result of which is that we are forecasting significant supply deficits in the planning period. Over the planning period, the additional water we need to find rises from 54.5 Ml/d in 2035, rising to 179.8 Ml/d in 2075.



We have reviewed a range of options to bridge this supply demand balance gap, which include new demand reduction options and new supply schemes. These options were used in the investment modelling to develop our best value plan which accounts for environmental protection, national targets, and customer preferences. Our plan has since been updated to reflect the consultation, which has been published alongside our Statement of Response.

In order to ensure we can meet the required demand for water, our WRMP24 consists of the following options, which include:

- **Starting in 2025-2026** – implementation of the 'High-Plus' basket of demand management measures. This includes reducing leakage by 50% by 2040 and an ambitious programme to install smart water meters for all customers within 10 years.
- **From 2025-2026 until 2040-2041** continue to allow for existing drought schemes as set out in our Drought Plan.
- **From 2025-2026 until 2038-2039** reduce the risk of requiring Emergency Drought Order by planning for 1-in-200 Levels of Service initially and then moving to 1-in-500 by 2038-2039.
- **From 2025-2026** continue to meet existing bulk supply obligations to Southern Water and to allow for future requirements. Some of these exports reduce overtime as our available supplies reduce as we make sustainability reductions for environmental protection.
- **From 2033-34** benefit from upgrades to network boosters that unlock deployable output associated with Havant Thicket Reservoir.
- **From 2039-40** receive an import from Southern Water.
- **From 2046-47 onwards** increase the transfer and treatment capacity within our network to allow additional water to be abstracted and treated from Havant Thicket Reservoir. This option is linked to the development of strategic regional resources by other companies to allow for further capacity increases.

In line with regulatory requirements, we have looked at a range of potential futures based on projections of population growth, climate change and environmental protection. Our investment in the first 15 years of the planning period is very consistent, indicating that the proposed set of investments would be required in all future scenarios. We will track and monitor annually which potential future is emerging which will inform our adaptive plan.

These options balance our supply demand deficit, ensuring we can continue to ensure a security of supply to our customers.

Our plan also seeks to meet the demand-side targets set out in Defra's Environmental Improvement Plan (EIP ,January 2023) by 2050 and for leakage we aim to bring forward delivery of the target by 10 years (by 2040).

We are confident that our WRMP24:

- Meets our statutory and regulatory obligations.
- Incorporate the long-term government requirements for leakage and demand reduction.
- Aligns with the WRSE regional plan and that it has been developed in accordance with the national framework and relevant guidance and policy.
- Is consistent with PR24 business planning assumptions.

About this document and summary of the plan

This Water Resources Management Plan 2024 (WRMP24) is part of a statutory process. A WRMP sets out how a water company intends to achieve a secure supply of water for customers and a protected and enhanced environment. The duty to prepare and maintain a WRMP is set out in sections 37A to 37D of the Water Industry Act 1991. We must prepare a plan at least every 5 years and review it annually.

On 15th November 2022 we published our draft Water Resource Management Plan 2024 (dWRMP24) for consultation. The public consultation ran for a 12-week period and closed on 20th February 2023. We would like to thank all the individuals who shared their views, and the views of organisations they represent, during this public consultation.

The final WRMP24 is being published for information, and not for a further period of public consultation. As well as updates in response to the consultation comments we received, this WRMP24 includes updated outputs and data from the Water Resources South East (WRSE) regional modelling which included updated data in relation to:

- Population and growth forecasts to reflect updated data not available previously.
- Demand forecasts to reflect the above, and an updated base year for forecasts.
- Data and information on individual options, including option timing, costs, best value metrics, and option availability.
- Demand management options, including commitments to leakage and per capita consumption (PCC) targets considering Government policy expectations, including in the Government's Environmental Improvement Plan.
- Other data updates to reflect new data availability.

Alongside this work, we have updated the environmental assessments of the options in the plan, including in combination assessments of the options, taking account of consultation feedback from environmental regulators and other stakeholders.

We have also incorporated the demand-side targets set out in Defra's Environmental Improvement Plan (EIP, January 2023) as well as the most recent revision (Version 12 March 2023) of the Water Resources Planning Guidelines (WRPG).

The plan builds on our proud history of serving the wider Portsmouth and Chichester areas with water for the last 165 years and is the continuation of a well-established planning process. However, there have been several improvements in the way we have created this plan, enabled by the development of new modelling approaches and data sets.

This is our most ambitious and most collaborative plan yet. This plan means that the company will become more resilient to increasingly severe drought events, at the same time as reducing our reliance and impact upon the precious chalk-based environment that characterises our supply area. To achieve this, we have worked in alliance with the other water companies across the South East of England, listened to the views of customers and engaged with regulators and stakeholders.

This plan presents the supply-demand balance throughout the next 50-year planning period (2025–26 to 2074–75). It demonstrates the need for investment to maintain the balance between supply and demand over that period. It shows how we derived feasible options to either reduce demand for water or increase the supply of water. It lays out the programme of actions we are proposing to ensure a reliable and resilient water supply for our customers, our environment and to contribute to the resilience of water resources for the wider South East of England.

This is the main statutory document for the WRMP24. It is supported by Water Resources Planning Tables and detailed technical appendices. The following sections present a summary of the main plan.

Our Company

At Portsmouth Water we are proud of our long tradition of serving Portsmouth and the wider surrounding area with high quality drinking water since the Company was established in 1857. Through amalgamation, the Company's supply area has expanded beyond Portsmouth to supply the towns of Gosport, Fareham, Havant, Chichester and Bognor Regis, in the counties of Hampshire and West Sussex.

Figure 1: The Portsmouth Water supply area

On average, we distribute around 175 million litres of water each day to over 740,000 customers in around 320,000 properties. We also provide water to neighbouring water companies in the South East. Some customers on new housing estates are also supplied by New Appointments and Variation companies (NAVs).

We are a "water only" company. That means we only supply drinking water to customers. Southern Water provide the wastewater service to our customers.

Key facts about our supply area

- 100 per cent of our water comes from chalk-based sources – Approximately 60 per cent of our water comes from boreholes and wells, 30 per cent from groundwater springs and 10 per cent from the River Itchen.
- Our abstractions influence flows in the Itchen, Meon, Ems and Lavant chalk streams and rivers.
- Our customers each use an average of around 153 litres per day. This is 5 per cent higher than the national average of 145 litres.
- Almost a third of our 3,400 km of pipes were laid or refurbished before 1960 – with around 700 km before 1940.
- The area we serve has significant differences in population density, with a contrast from central Portsmouth to the villages of the South Downs.
- We generate 10 per cent of our energy from solar panels and are trialling electric and zero emissions vehicles.

- Our average bill is £117 a year. This is the lowest in the industry and significantly below the UK average of £215.[1] We've been identified by Ofwat as one of the most efficient water companies in the UK.
- Our supply region contains areas of the South Downs National Park, protected marine harbours and numerous Sites of Special Scientific Interest. The chalk geology across our supply area supports us in providing excellent quality drinking water as well as the important and beautiful habitat we enjoy.

Our Vision

Excellence in Water. Always.

Our Vision is reflected in our planning for water resources.

Water resources are fundamental to our business. As such, the WRMP24 is core to our wider Business Plan, with both plans being developed in parallel with shared governance. Section 10 of the main plan provides further detail and links to the WRMP to our PR24 Business Plan and Long Term Delivery Strategy.

Our vision statement '*Excellence in Water. Always.*'[2], sets out our ambitious vision for the next 25 years, operating against the backdrop of climate change, population growth and a changing world. It outlines our commitment to provide an affordable, reliable, and sustainable supply of high-quality water for our customers. By being smart in our approach, we will work with our local communities to meet our goals while protecting and enhancing the environment for future generations. We have identified four priorities as a business that will support delivery of our vision, shown in Figure 2.

The following four principles are central to how we'll realise our vision:

- **We are smart about water:** Being smart about water means embracing innovation, the digital revolution and new ways of working. This is most clearly demonstrated in this WRMP24 by our preferred option to deliver universal household smart metering to help our customers manage their water use. By reducing unnecessary water waste, providing customers with information about their water use, and helping leaks to be identified and fixed more quickly, this philosophy is essential for providing excellent high-quality services, fit for future generations.

- **Our plans are adaptable to future challenges:** We know the future contains challenges and there is a lot of uncertainty around exactly how these will impact us. We also know unexpected events can have dramatic impacts. The adaptive planning approach we have used to develop this WRMP24 helps us choose options now that will prepare us for a range of possible futures. It means we understand when and what the key decision points are to ensure we can adapt to whatever the future holds – developing flexible, long-term plans so we can change course if we need to.

- **We focus on customers' priorities:** We put our customers first – pushing the boundaries of our performance with the environment at the heart of our decision-making. As a company rooted in our communities, we are committed to increasing our customers' voice in our planning and delivering their priorities.

- **We run our Company responsibly**: We're accountable to our customers, stakeholders and colleagues and take responsibility for our decisions. We're honest, transparent, and

[1] DiscoverWater (en-GB)
[2] Our Business Plan 2025 to 2030 | Portsmouth Water

fair in everything we do. We uphold the highest standards of leadership, transparency and governance and maintain a resilient financial position.

Our final WRMP24 represents an increased level of ambition compared with the dWRMP24 in the area of leakage, one of the most important areas for our customers. Where our dWRMP24 committed to delivering a halving of leakage by 2050, the support demonstrated by customers during the public consultation of our WRMP has led us to bring this delivery target forward by ten years to 2040.

Figure 2: Our priorities as a business, and the specific commitments that are embedded in both our business planning and this WRMP

Drivers for change since WRMP19

Our operating environment

This WRMP24 is our most ambitious plan yet.

This ambition reflects the scale and complexity of the water resources challenge facing us, directly resulting in Defra's acceptance of the Environment Agency's July 2021 recommendation that our area should be reclassified by the Environment Agency as being '**seriously water stressed for metering**'. This classification formally acknowledges that without appropriate investment, there is a risk that the service customers receive for their water supplies could be significantly affected. As a result of this we have proposed an option to implement universal metering across our household customer and non-household connections as an option to reduce customers demand for water.

Companies across the country, who were previously already designated as areas of serious water stress and have implemented, or are in the process of implementing metering to their domestic customers, have shared their experiences with us. Their evidence shows smart metering can deliver domestic demand savings of between 13 and 18 per cent.

The largest challenges we face in our supply area are driven by the anticipated growth in population and property numbers, coupled with the effects of climate change and the need to reduce our reliance on the water resources characterised by the iconic and precious chalk-based environment.

Key challenges we face as we plan for sustainable and resilient water resources

- Climate change and changes to land use could put sensitive environments, such as chalk streams, at risk.
- We're predicting we'll need to secure up to 165 million litres (megalitres) of additional water per day by 2050, due to increased demand, drought resilience, climate change and to replace water currently being taken from chalk aquifers. This number has been revised since the dWRMP24, with our latest view of potential sustainability reductions being delivered sooner and to a greater volume than the dWRMP24.
- Our infrastructure is getting older and wasn't designed to meet the impacts of the more frequent extreme weather events we're facing.
- We need to reduce our emissions to meet carbon net zero and help slow climate change.
- We need to ensure our services remain affordable for all – especially considering the cost-of-living crisis and for those in vulnerable circumstances.

Our plan is still based on a single Water Resource Zone (WRZ) that covers our supply area. This means all households in our supply area experience comparable levels of service. Our planned levels of service and use of drought options are consistent between the WRMP and our 2022 Drought Plan over the five year operational life of the current drought plan. These are:

- >1-in-20 years for Hosepipe Bans, representing an annual risk of 5 per cent.
- >1-in-80 years for Non-Essential Use Bans, representing an annual risk of 1.25 per cent.
- >1-in-200 years for Emergency Drought Orders, representing an annual risk of 0.5 per cent.

Section 1.4.4 of our 2022 Drought Plan[3] foresaw the requirement for greater levels of resilience in WRMP24 that will need to be reflected in future revisions of the Drought Plan.

Planning Guidelines and Government Advice

Building on the previous WRMP19[4], the WRMP24 has been developed in compliance with regulatory requirements and Government advice. It adopts new data sets and methodologies, and accounts for the recent social and economic shifts we have experienced since the last planning cycle. Additionally, it reflects the latest thinking around key considerations such as climate change mitigation and adaptation, working towards net zero carbon, and protecting the water environment.

Since our WRMP19 was published, there have been both significant shifts in the planning landscape, as well as the continuing evolution of data, methods, and our understanding of the natural environment.

National Framework for Water Resources

A significant influence on this Plan has been the Environment Agency's National Framework for Water Resources (launched in March 2020). The Framework sets out a national aspiration to leave the environment in a better condition than we found it, while improving resilience to drought and minimising interruptions to water supplies. The Framework took on board many of the recommendations from the 2018 National Infrastructure Commission (NIC) 'Preparing for a Drier Future' report such as the need for improved drought resilience and strengthened regional planning.

The National Framework for Water Resources established a requirement for the delivery of regional plans and for those plans to explicitly inform individual company WRMPs. They also set out some core planning objectives for all company plans. These National Framework objectives (now further strengthened by more recent regulatory requirements) included:

- To reduce the average amount of water individuals use to 110 litres of water per person per day by 2050,
- To facilitate a reduction in water use across all customer sectors,
- To halve leakage rates by 2050 (based on a baseline of 2017–18) and
- To reduce the use of drought measures that have an impact on the environment.

All these objectives and requirements are reflected within our WRMP24.

Environmental Improvement Plan

In January 2023 the Government published its Environmental Improvement Plan (EIP). This is the first revision of the 25 year Environment Plan. One of the ten Goals presented in this plan was, 'Goal 3: Clean and plentiful water'. The following three targets and commitments found on page 99 of the EIP directly influenced revisions to our WRMP:

- Reduce the use of public water supply in England per head of population by 20% from the 2019 to 2020 baseline reporting figures, by 31 March 2038, with interim targets of 9% by 31 March 2027 and 14% by 31 March 2032, and to reduce leakage by 20% by 31 March 2027 and 30% by 31 March 2032.
- Water companies to cut leaks by 50% by 2050.
- Target a level of resilience to drought so that emergency measures are needed only once in 500-years.

[3] www.portsmouthwater.co.uk/wp-content/uploads/2022/04/Final-Drought-Plan-2022.pdf
[4] This is considered to be the Revised WRMP19 (Dec 2022). Referred to as WRMP19 from this point forward.

To support delivery of the EIP the Government committed to rolling out a new water efficiency labelling programme and delivering the ten actions set out in the Roadmap to Water Efficiency in new developments. Our ability to meet the challenging per capita requirements is reliant on successful and timely roll-out of these government initiatives.

Water Resource Planning Guideline

The Environment Agency's Water Resources Planning Guideline (WRPG), originally published for this round of planning in February 2021, needs us to:

- Ensure that water supplies move from being resilient to an event we might expect to see once in every 200 years (i.e. a 0.5 per cent chance of happening each year) to being prepared to provide a reliable supply in a drought event we might expect to see once in every 500 years (i.e. a 0.2 per cent chance of happening each year).
- Present an environmental ambition with potential short, mid and long-term reductions in supplies to protect our environmentally important chalk catchments and therefore associated investment for new interventions to enable us to continue to meet customer demands in future.
- Incorporate the uncertainty associated with the impact of Covid-19 on demand in the future.

After the dWRMP24 was published for public consultation in January 2023, the Environment Agency issued a revised draft WRPG for WRMP24 and asked water companies to comment on the proposed changes. We submitted our comments through a shared WRSE regional response and in April 2023 the Environment Agency published a final updated version 12 of the WRPG.

The following bullet points provide a high-level summary of the changes to regulatory expectation and the implications of these for our WRMP:

- More ambitious household per capita consumption (PCC) delivery target of 110 l/h/d by 2050 is a government expectation at a water company level under the dry year annual average (DYAA) planning condition.
- A challenge to bring forward environmental destination delivery.
- A challenge to deliver resilience to a 1 in 500 drought event before 2039/40.
- A 9% reduction in non-household water demand by 2037/38 from a baseline of 2019/20 and a 15% reduction by 2050.
- Request for utilisation rates for options that are selected as part of our preferred plan.
- Additional environmental assessment criteria for 'Significant Effects'.
- Expectation for water companies to produce an appendix reflecting how it has considered its experiences of the unprecedented temperatures and associated peak demands from summer 2022.

As a result of this updated regulatory guideline we have made several changes to our WRMP including the addition of a new appendix providing information about the 2022 drought event and making our ambitions to encourage the reduction of household demand for water across our supply area more ambitious by aiming to achieve it in dry years as well as in normal years.

Collaboration through the regional plan

Water Resources in the South East (WRSE) is an alliance of the six water companies that cover the South East of England – Affinity Water, Portsmouth Water, SES Water, Southern Water, South East Water and Thames Water (see Figure 3). WRSE was formed several planning cycles ago to help the companies develop plans to optimise the use of water

resources across the South East. But with the requirement to produce a regional plan explicit in the Environment Agency guidance, the role of WRSE has significantly grown this planning round.

Through WRSE, the companies of the South East have developed common methodologies, shared data sets and a regional adaptive planning approach to meet future water resource challenges. This ambitious multi-sector regional plan uses new, sophisticated modelling and forecasting methods which are then reflected in our own individual company plan, to align with the wider region.

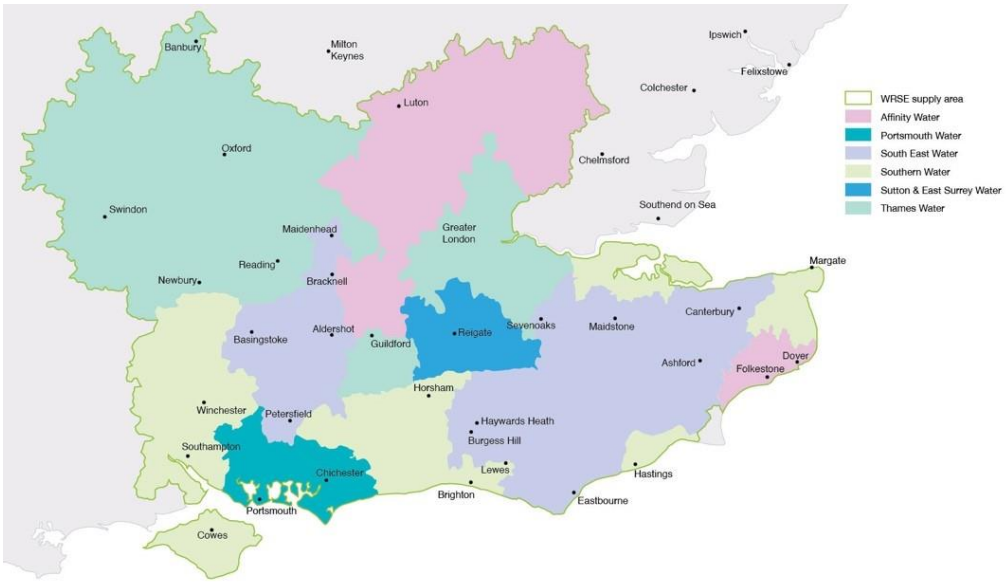


Figure 3: The supply areas of the six water companies who form the Water Resources South East (WRSE) alliance

WRSE commissioned the development of a regional investment model. Using agreed metrics, the model helps us to identify the investment options that provide sufficient supplies of water in the right place at the right time to meet anticipated demands, while addressing legal and regulatory requirements and policy expectations. To enable the use of this model it was necessary to carry out detailed assessments of our options and to consider wider benefits beyond cost in line with WRSE methods to ensure consistent data inputs. This approach allowed us to identify whether we can deliver additional value through our plan that will further improve the region's environment, resilience and benefit wider society. This could mean some options are chosen because they deliver greater value to the region, not just on their cost.

By aligning with the South East regional multi-sector resilience plan for water resources, our WRMP24 aims to balance national, regional, and local interests - reflecting the best value for our customers as well as the best value regional plan and the investment and environmental ambitions of our regulators, customers and stakeholders.

We are fully committed to the WRSE approach. As such, where appropriate we are referencing WRSE's method statements and other published documents. Our revised draft plan (in Section 10) has been informed by the revised draft regional plan, with modifications for local considerations to ensure that the plan is company specific to meet statutory requirements.

Havant Thicket Reservoir

A key legacy from WRMP19, which has formed a cornerstone of our ongoing planning process, is the development of Havant Thicket Reservoir. By enabling us to store surplus winter spring flows for use in the summer, we can increase the quantity of water we supply to Southern Water, which in turn allows them to make environmental improvements by reducing their reliance on sensitive chalk sources in Hampshire. In addition to supporting reduced abstraction on chalk rivers, the scheme has an overall biodiversity net gain and will offer a new community leisure hub for our region.

The reservoir scheme, as proposed in WRMP19, is unchanged and has been included in the baseline assumptions for this plan (with a revised delivery date of 2031/32[5]). It was supported by customers and regulators and is being developed in partnership with Southern Water. This will be the first new reservoir to be built in the South East since the 1970s. Havant Thicket Reservoir has received planning permission and work on site is ongoing.

The approval for the development of Havant Thicket Reservoir within WRMP19 enabled us to make a major contribution to long-term resilient water resources development in the South East.

The possible contribution of this new asset to regional water resources is something we have reviewed and developed further for this WRMP. Completing Havant Thicket Reservoir unlocks new local and regional options for future water security, such as water recycling. These types of options are needed to meet some of the new challenges, such as significant reductions in our abstractions from Chalk catchments and improved resilience to droughts occurring once every 500 years.

The building blocks of our plan

Introduction

The full collaborative nature of the development of our WRMP24 is shown in Figure 4. This 'Plan on a Page' shows each building block that has played a part in the plan's development, alongside where in this document you can find more detailed information.

The green elements show items that were developed and assured by Portsmouth Water. The brown elements show the areas that have been commissioned and assured in regional collaboration.

Many of the steps that we have delivered directly (shown in green) have followed the regionally agreed methods and approaches ensuring the input data to the regional planning process was consistent and comparable across each of the six water companies.

Some of the WRSE approaches are new, while others are based on established methods which have been widely used by water companies in preparing past water resources management plans. Where we have referenced a WRSE method we have included this method statement within our WRMP24 list of supporting appendices. In addition, WRSE documents can be located in the WRSE library: https://www.wrse.org.uk/library

[5] The Havant Thicket Reservoir was originally designed to provide benefit from 2029-30 but is now forecast to provide benefit from 2031-32. The delay is the result of an opportunity to future proof the pipeline tunnel included within the approved scheme to accommodate HWTWRP if approved (i.e. the proposed recycling facility) and is a worst-case scenario.

Working through WRSE, we ensured that all processes follow and are fully compliant with the Water Resources Planning Guidelines (WRPG), the EIP targets and the National Framework.

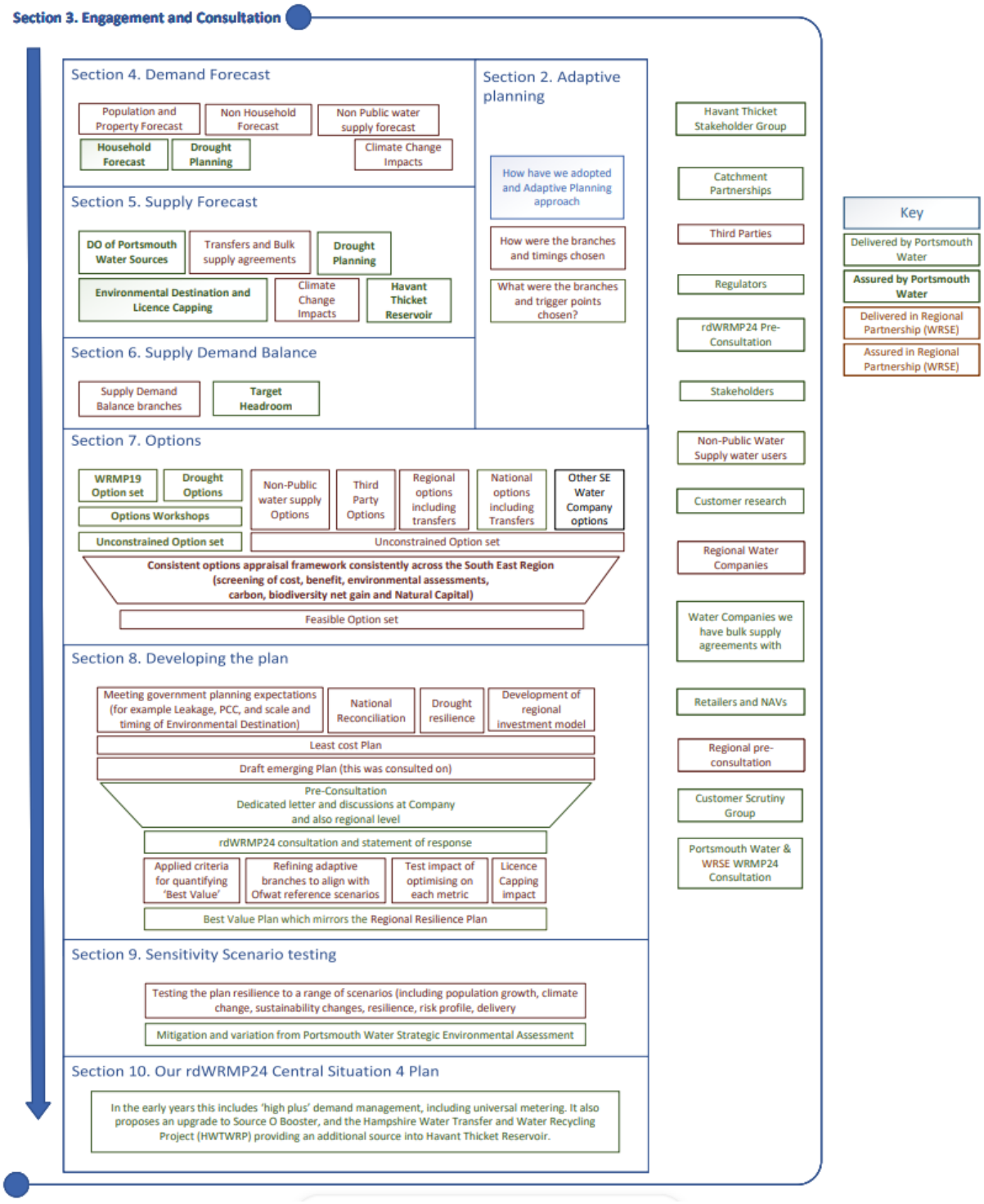


Figure 4: Components of this WRMP24, illustrating both the process and the extent to which this Plan has been developed in collaboration

Baseline demand forecast

The baseline demand forecast is the amount of water that would be required by customers in the future **should no new demand-side interventions be made** and is a key component of our plan. The forecast was developed and assured by us, using an agreed regional methodology, with certain sub-components prepared by WRSE to ensure consistent planning scenarios.

Our demand forecast has been refreshed for the WRMP24. Our base year has been updated to 2021-22. This has involved updating the population and property forecasts to reflect numbers based on the 2021 Census, and our 2021/22 annual performance reporting which includes leakage and metering. Moving the base year of our demand forecast has had the impact of increasing the amount of water we assume households are using at the start of our planning period because the starting position now includes the post-pandemic 'new normal' of more people working from home for significant periods.

The regional multi-sector planning approach section (2.2) in our WRMP24 defines and explains the basis of the different demand scenarios we have used. As part of our adaptive planning approach, and to account for uncertainty, different demand scenarios have been generated for high, medium and low growth in population and new property numbers. The scenarios include a forecast of future demand for water from households, businesses, industry and other sectors, whilst accounting for climate change, leakage, population and property growth.

Since 1995, when a standard method for leakage reporting was introduced, we have reduced leakage by 30.9 per cent. Leakage in 2021–22 was 15 per cent of the total water we put into supply. When normalised across the water industry by the number of properties we supply, we had the second lowest leakage rate of water companies in England and Wales. For generating a baseline demand forecast, the planning guidelines require us to model leakage as a single value throughout the duration of the plan.

Under dry year annual average conditions for our "reported pathway" (which is our preferred planning scenario for the purposes of this plan) baseline demand (i.e. without further intervention) is forecast to **grow** over the planning period from **179.48 megalitres per day (Ml/d) in 2025–26 to 208.32 Ml/d by 2074–75**. This rise is driven by increasing water use by household and non-household customers as detailed in Table 1.

Table 1: Baseline demand for our reported pathway in dry year annual average (DYAA) conditions

Baseline demand (without intervention)	2025–26	2049–50	2074–75
Total demand (Ml/d)	179.48	198.35	208.32
Household demand (Ml/d)	134.98	152.15	158.61
Non-Household demand (Ml/d)	30.59	32.29	35.80

Baseline supply forecast

The baseline supply forecast is the amount of water that is available for us to put into supply in the future **should no new interventions be made** after the start of the planning period and is the second key component of our plan. It was developed and assured by us, but to an agreed regional methodology.

Our supply forecast is reported as "water available for use" (WAFU) within our water resources planning tables that accompany this WRMP24. This is the water available from our own sources (referred to as “Deployable Output” (DO)), with adjustment reductions due to climate change, process losses or operational constraints, plus water exported to other companies.

Havant Thicket Reservoir is now part of our baseline supply forecast and therefore included in the WAFU calculation. The reservoir has received planning permission and is in the construction phase. Figure 5 shows an illustrative and indicative example of how we calculate WAFU.

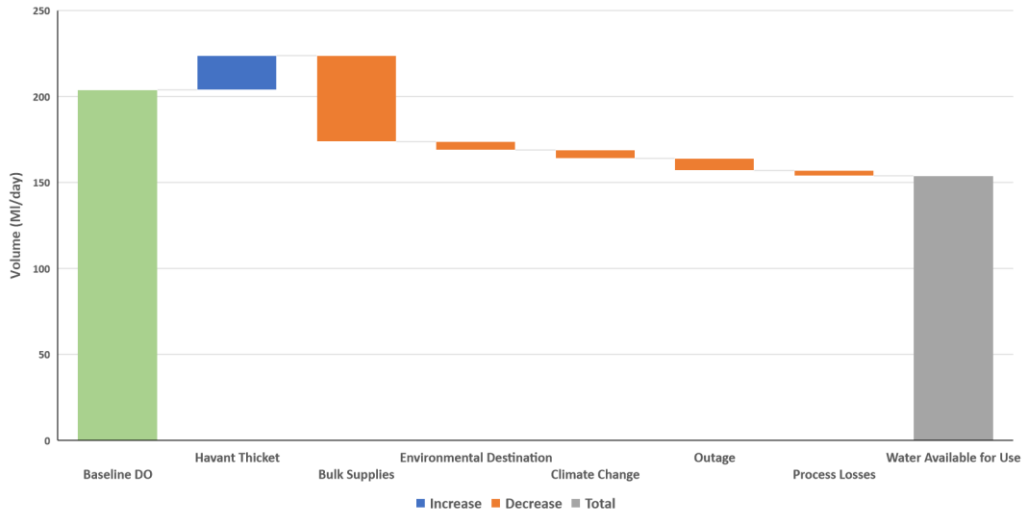


Figure 5: An example of how we calculate Water Available for Use (WAFU).

Our first step when developing the baseline supply forecast was to review the WRMP19 supply forecast and, where still relevant, build on this instead of duplicating it. The key assumptions included in the supply side forecast are outlined briefly below with more detail provided in Section 5:

- **Deployable Output Assessment**: This has been informed by the development of a new water resource system modelling tool called ‘Pywr’ which can account for large synthetic, but plausible, climatic and hydrological data sets known as stochastics.

    - The model has led to an improved understanding of the way individual sources of water work conjunctively together as part of the overall supply system and the resilience this provides in a greater variety of drought events. This understanding has prompted development of a network improvement option that can add to our ability to supply reliably during drought conditions by removing current network constraints to unlock conjunctive use benefit associated with Havant Thicket Reservoir.
    - We have planned in line with the Government’s National Water Resources Framework and the Water Resources Planning Guidelines so that our system becomes resilient to a 1-in-500 chance of implementing an emergency drought order by 2039. This can also be described as ‘1-in-500 year’ level of drought resilience.
    - Increasing our level of resilience from a 1-in-200 to a 1-in-500 year drought has had the overall impact of reducing the water we can rely upon from our existing sources of water by 8.44 Ml/d in 2039-40.

The following points describe other components of our supply forecast:

- **Bulk Supplies**: We provide bulk supplies to our neighbouring water company, Southern Water. The supply forecast assumes that bulk supplies cease at the end of existing contracts, after which point they become options within the WRSE investment model. Therefore, bulk supplies in the baseline supply forecast are zero beyond 2029–30.

- **Sustainability Abstraction Reductions** associated with our proposed Environmental Destination in 2050 (incorporating the latest "Licence Capping" policy) have a significant impact on our supply forecast. The scale of these reductions is one of the main areas of uncertainty in our plan, with the potential to reach 122 Ml/d in 2050 in our reported pathway for the dry year annual average scenario. Leaving more water in the environment reduces how much water we can take from some of our existing sources. Since the dWRMP24, these potential reductions are around 16 Ml/d greater and planned to be delivered by 2050, rather than 2054.

- **Climate Change**: Our previous assessment for WRMP19 was based upon the UKCP09 data set. This data set has since been replaced with the UKCP18 projections. Data from UKCP18 provides the most up to date climate change projections available for the UK, using the best climate models from the UK and around the world. Climate change impacts rise from -2.7 Ml/d in 2025–26 to -13.7 Ml/d by 2074–75 in our reported pathway. For the final WRMP24 we have expanded our climate change assessment to utilise the full stochastic data set compared to the subset considered during the draft. This has increased the robustness of our assessment particularly when looking to understand the impact of shorter return period drought events on the resilience of our network.

- **Outage** is defined as a "temporary loss of deployable output at a source works". It can relate to planned or unplanned events and covers a wide range of influences from power failure to short term pollution incidents. The WRMP19 assumptions have been reviewed and updated which has reduced our assumed reduction in available water due to outage. Since the dWRMP24 the outage assessment has been revised based on the updated Deployable Output assessment. As part of this review, Havant Thicket Reservoir has been included in the outage assessment which results in a 0.2 to 0.3 Ml/d increase in the outage allowance.

- **Process Losses** occur between the point of abstraction and the point at which water enters the supply network and account for the loss of water during the treatment process. The WRMP19 assumptions have been reviewed and maintained as the assumptions remain valid.

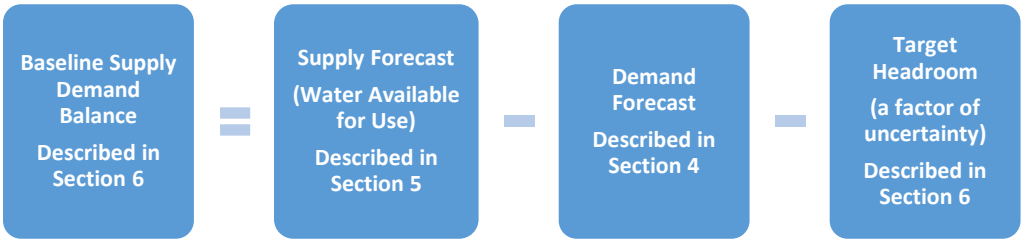
As a result of these factors the baseline dry year WAFU **reduces** from around 150 Ml/d in 2025–26, to 70 Ml/d by 2049–50 and then 66 Ml/d by 2074–75, largely driven by environmental considerations. This is a substantial decrease of **56 per cent** and drives much of the investment proposed in this WRMP24.

Baseline supply demand balance

The supply demand balance is a forecast of what would happen to our levels of service to customers if we did not take any new supply or demand actions and did not implement any changes in Company policy or existing operations. Section 6 of this WRMP24 provides details of our baseline supply demand position.

Our baseline supply demand forecast has been calculated by the WRSE investment model based on baseline supply, demand and headroom forecast information we provided for our water resource zone. It has been calculated using consistent assumptions across the South East regional planning area.

The baseline supply demand balance compares our baseline supply forecast (defined as Water Available for Use) with the baseline demand (represented by Distribution Input) and Target Headroom. The baseline position is based on the dry year annual average (DYAA) for demand and a design drought for supply. Our existing contracts with Southern Water to provide bulk supplies are included as part of our forecast baseline demand.



The supply demand balance for our reported pathway (also known as “Situation 4” within the WRSE investment model) is presented in Table 2.

Table 2: Baseline supply demand balance for our reported pathway for dry year annual average (DYAA) conditions

	2025–26	2029–30	2034–35	2039–40	2044–45	2049–50	2059–60	2074–75
Total Water Available for use in Ml/d	149.6	179.1	159.1	127.1	98.8	70.4	68.8	66.4
Distribution Input in Ml/d	179.5	184.2	188.4	192.1	195.1	198.6	202.6	208.3
Target Headroom in Ml/d	4.2	5.2	3.5	2.2	1.7	1.3	1.2	0.9
Supply Demand Balance in Ml/d	-34.1	-10.2	-32.8	-67.2	-98.0	-129.2	-135.0	-142.9

The negative values in the supply demand balance row of this table show that without new interventions we would have insufficient water to meet the service requirements for our customers for the majority of our planning period.

Factoring in uncertainty

Target headroom is an allowance in the planning guidelines to consider the inherent uncertainties in modelling. It acts as a 'shock absorber' in the calculations to absorb any risk. Through the target headroom allowance, risk and uncertainty is translated into an appropriate water resource planning margin.

The evolving methods and data used to plan water resources across the sector mean that some of the risk that has historically been accounted for in target headroom is now accounted for across several other parts of the plan, such as in the adaptive planning situations and the application of a 1-in-500 year supply forecast. In practical terms this means that the application of past approaches to calculating target headroom could lead to double counting of uncertainty in the context of this WRMP24. This risk is addressed by adopting a regionally consistent adaption of the UKWIR 2002 headroom methodology to prevent double counting of uncertainty within the adaptive planning approach.

Between the dWRMP24 and final WRMP24, the target headroom assessment has been revised to remove the impact of Covid-19 on demand. This had been included in target headroom as a one-sided risk for the dWRMP24 because the dWRMP24 baseline demand used pre-pandemic demand data. For the final WRMP24 the demand forecast base year was revised to 2021-22 which means baseline demand now reflects the impact of Covid-19 on demand.

Whilst the main impact of Covid-19 is now reflected in the baseline demand instead of target headroom, the target headroom assessment still includes a Covid-19 component to reflect a degree of uncertainty in future impacts.

For the final WRMP24 we were also directed by Defra to incorporate contractual volumes for bulk supplies to New Appointments and Variations (NAV). However, because it can take many years for housing developments to be fully built and the contracted volumes of water consumption to be realised, there can be significant headroom in the supply demand balance

of a NAV's WRMP. To ensure there is no double counting of risk and uncertainty when comparing the NAV and the wholesaler WRMPs holistically, we have reduced the target headroom calculated in our headroom assessment.

Options appraisal process

From the baseline calculations it can be seen that without new interventions we would not be able to deliver the service that customers expect of us. We therefore undertook a significant options identification and appraisal process to identify potential interventions we could make to increase supply or reduce demand (the 'twin-track' approach). In Section 7, we explain our process to determine feasible options.

Initially, we reviewed existing planning assumptions within our WRMP19 and where these remain relevant and reasonable, we have continued their use (as published in our final WRMP from 2019, and subsequent revisions).

Our twin-track approach has considered options to increase the amount of water available for supply, as well as options to reduce the amount of water our customers require. We have looked wider than our own supply area, to work with neighbouring water companies, third parties and non-public water users and explore the potential for water trading and sharing.

Options were generated both internally from Portsmouth Water participants and externally through workshops, surveys and a WRMP19 gap analysis. External options were screened and generated in cohorts alongside WRSE, third parties and other water companies. Potential new options were identified to increase supply and reduce demand.

From this work we identified an 'unconstrained options' list of possible interventions as shown in Figure 6.

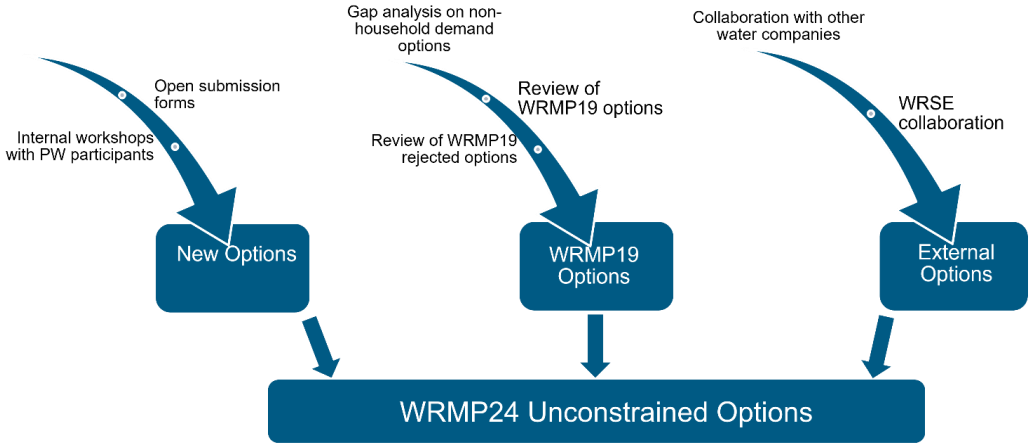


Figure 6: Overview of the WRMP24 Options process.

To determine if our potential options were feasible, we followed an agreed common WRSE methodology. This consistent method was also followed by the other water companies in the region and used by WRSE to consider transfer and non-public water supply options. By following a common and shared method, the regional investment model has fairly selected options from across the region to best resolve any water resources deficits and optimise on the options appraisal metrics.

Primary screening reviewed the options on a pass or fail basis, and this process determined which options were either to be carried forward to the secondary screening or placed on the rejection log. This initial screening focused on questions around feasibility, legal and planning constraints, costs and customer acceptability.

Secondary screening was split into two phases, with '2a' assessing environmentally based objectives, and '2b' assessing adaptability, resilience to climate change, water pressures and deliverability. Environmental objectives surrounding climate change were tackled through the reduction of greenhouse gas emissions and embodied carbon within the options. Strategies to achieve this include embodied carbon meters, and decarbonised construction and vehicle transport.

It should be noted that our WRMP24 is a statutory plan that sets a framework for future infrastructure development. This infrastructure has the potential to have significant impacts on the environment, including European and internationally protected nature conservation sites. As such, the final plan requires both a Strategic Environmental Assessment (SEA) and a Habitats Regulations Assessment (HRA). Several options were screened out at this stage, in the knowledge that they would not pass this test at the end of the process.

Costing was based on WRSE best practices, and the WRMP24 options were fed into the WRSE investment model to produce the least cost plan for the options based on construction costs, assets and risks.

The overall summarised process can be seen in Figure 7.

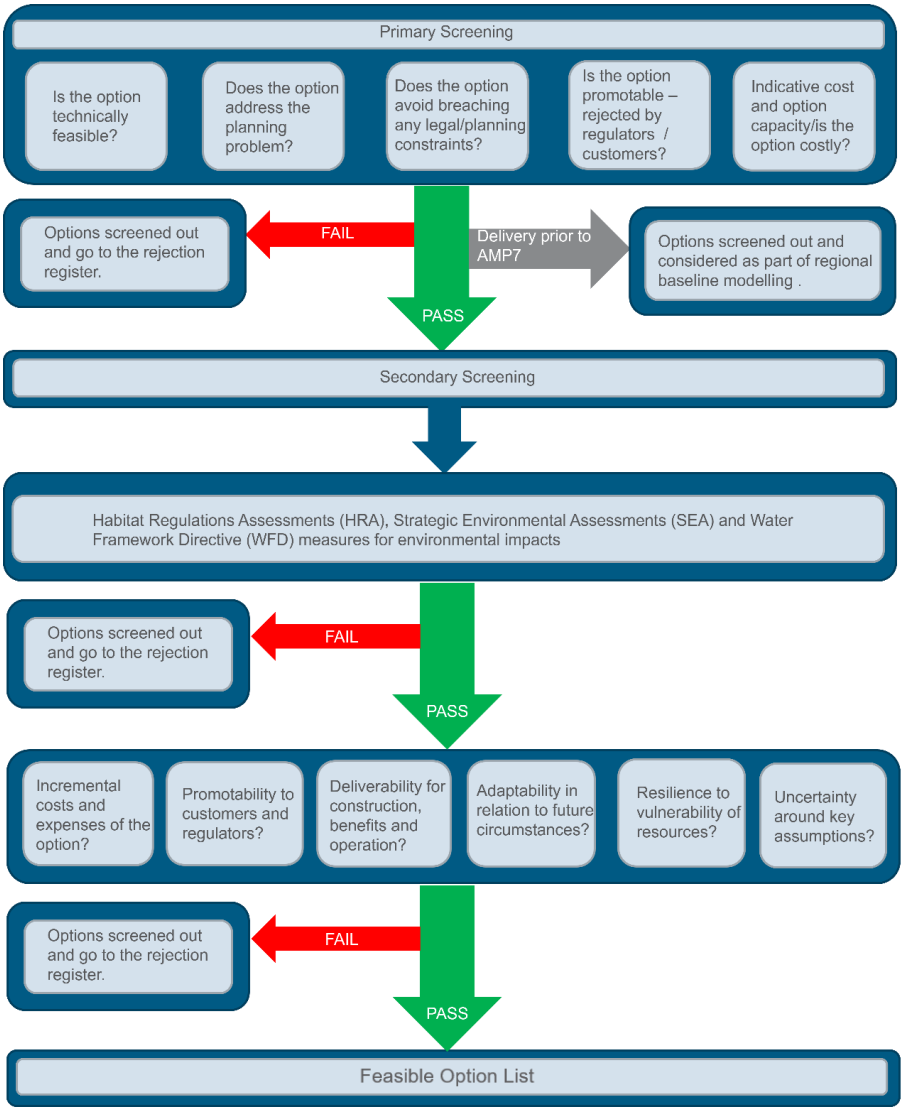


Figure 7: Summary of the Options screening process.

Screening reduced our **258** unconstrained option set to a final feasible option list of **19** options. The feasible options included sub-options to increase supply, reduce demand, and optimise the network.

Summary of Feasible options

Demand options

Our feasible demand management options were refined to a single "demand reduction basket" comprising ambitious volumes of leakage and water efficiency activities. This basket contains several interlinked interventions that will collectively deliver a demand reduction benefit. Since the dWRMP24 we have reviewed this demand basket in order to meet the Environmental Improvement Plan[6] targets for demand reductions which are greater than those in the draft plan. As a result, the 'High Plus' demand basket now includes new demand options.

Our demand side options also include the use of Temporary Use Bans and Non Essential Use Bans during periods of extreme drought.

Supply options

For the draft plan no new abstractions of water from our environment were included in our feasible options list. The water catchments in our supply area are designated as 'over-abstracted' within the Environment Agency's Catchment Abstraction Management Strategy and there is no scope for increased abstraction. However, since the draft plan we have a greater understanding of the future Environmental Destination of the region and for WRMP29 we will be reassessing supply options, in particular those which seek to capture excess winter flows.

As set out in our baseline supply forecast, we are forecasting a reduction in the amount of water we take from the environment to protect the precious chalk landscape and habitat we operate in.

The feasible supply options identified in the options process are to improve supply through:

- Maintaining our existing drought plan option of continuing to rely upon an existing drought permit until 2041.
- An option which reduces the level of service from a 1-in-500 to a 1-in-200 level of service[7].
- an option to improve network connectivity so we can move water around our supply area, freeing up water resources where we need them (unlocking conjunctive use benefits associated with Havant Thicket Reservoir).
- An import from Southern Water.
- Twelve remaining options to transfer and treat water across our supply area to utilise the water most effectively from Havant Thicket Reservoir.

We identified water recycling and desalination options in conjunction with storage provided by Havant Thicket Reservoir in tandem with Southern Water (the wastewater company

[6] Environmental Improvement Plan 2023 - GOV.UK (www.gov.uk)

[7] In the draft plan, the shift from a 1 in 200 to a 1 in 500 level of resilience (Emergency Drought Orders (i.e. rota cuts)) was captured via a change in deployable output in the baseline supply demand balance. Based on Regulator feedback, the change in the level of resilience is now expressed as an option, rather than the baseline. This change has resulted in an additional option in the rdWRMP24 list of feasible options.

serving our area). Most of these options have been taken on by Southern Water in their unconstrained list. Some elements have been included in their Strategic Resource Options (SRO) submissions to Ofwat via the RAPID gated process.

Developing the Plan

In conjunction with WRSE and the regional investment model, our WRMP24 represents what we consider to be a 'best value' plan and not a 'least cost' plan. A best value plan is one that considers other key factors alongside economic cost and seeks to achieve an outcome that increases the overall benefit to customers, the wider environment and overall society.

The process of how we moved from a feasible list of options to a best value plan is described in the WRSE graphic presented in Figure 8.

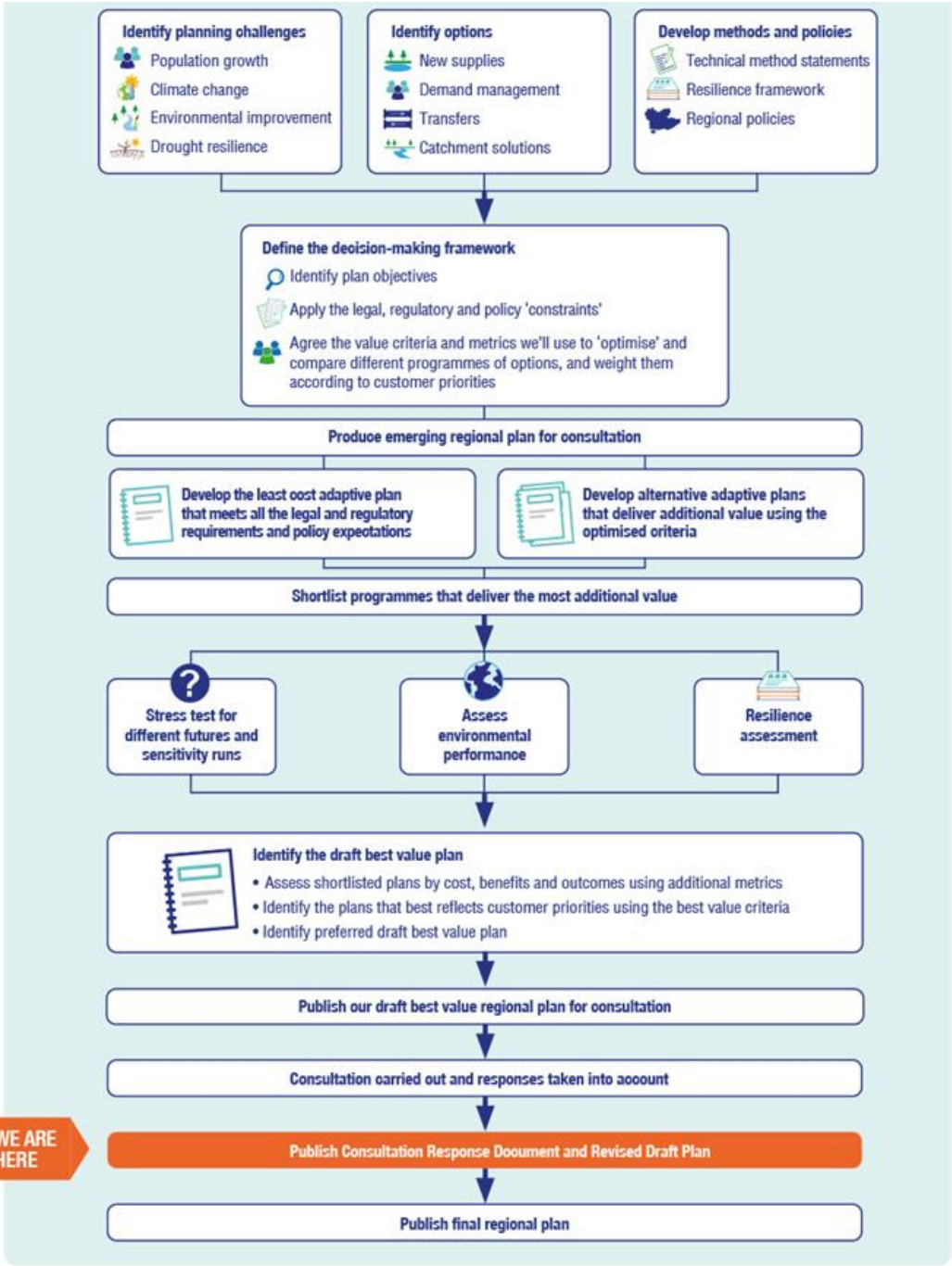


Figure 8: The regional approach to best value planning (from WRSE Draft Plan Annex 1, 2022)

Testing the Plan

We have tested the WRMP24 through a series of different sensitivity scenarios considered to represent the main areas of uncertainty concerning risk to supply and demand.

Section 9 of our plan describes the scenario and sensitivity analysis undertaken to ensure it is robust in the face of future uncertainties. Through this performance testing analysis, we are typically examining 'what if' questions such as:

- **What if a key scheme cannot be delivered**: A particular area of focus in the scenario testing is to explore the robustness of the plan to risks that key schemes cannot be

delivered. The purpose is to identify the alternative schemes that are or may be needed.

- **What if a key scheme does not deliver the expected benefits:** the purpose again is to identify the alternative schemes. This may also include assumptions around demand management e.g. what if government-led water efficiency reductions do not materialise.

We can understand the implications of this testing primarily through the adaptive planning process described in the following section. Possible future scenarios relate to uncertainties in forecasting supply and demand components – such as population growth, customer behaviour, impacts of climate change, impacts of environmental destination on the available sources.

The sensitivity testing has demonstrated that our plan is robust, with the same options being selected in the near future and with near consistent implementation timescales. However, it does demonstrate that our plan is strongly reliant upon the proposed anticipated reductions in demand which are partly dependent on government-led initiatives. Tracking the timetable and success of reductions in demand is the core focus of our monitoring plan.

Adaptive planning

In previous planning rounds, WRMPs have been based on a single forecast future scenario which is used as the basis to identify options to balance a single future scenario's supply and demand. Uncertainty in that future was identified through scenario and sensitivity testing of the plan.

Due to the significant range and scale of potential future scenarios and the challenges that we face, a refined approach has been identified for WRMP24. In line with planning guidelines and in collaboration with WRSE, we have followed an 'adaptive planning' approach to develop a regional plan to secure water supplies for the South East to the year 2075, and our company WRMP is integral to that regional plan.

Section 2 of this WRMP24 introduces the concept of adaptive planning and explains why it is needed. It provides an overview of the adaptive pathways we have used within our plan.

Adaptive planning is an approach to developing and articulating long-term delivery strategies by setting out decisions against a range of plausible future scenarios in an uncertain future.

To develop our adaptive plan, working with WRSE we identified 580 different potential futures based upon five different population growth scenarios, 29 climate change scenarios and four differing environmental scenarios. Through a process of optimisation, nine scenarios comprising combinations of these factors were taken forward by WRSE to reflect the range of plausible futures.

These nine scenarios span from low challenge benign futures to high challenge adverse futures and can be represented as a tree of alternative pathways or branches. They start from a central core forecast founded upon the most likely scenario in the immediate short-term reflecting key current or expected policies. This then branches into three pathways by 2035 associated with futures surrounding forecast population and property growth. Each of these three pathways then branch again into a further three pathways (nine in total) in 2040 to account for uncertainty in deployable output (DO), reductions in environmental ambition and to recognise long-term climate uncertainty.

These scenarios have been produced in accordance with the Environment Agency's and Ofwat's guidance to plan for future uncertainties.

By tracking key metrics associated with the decision points, the pathway diagrams can be used to understand when key decisions must be taken to deliver our ambitions. Investment can be scheduled, and options implemented in response to new information that indicates the triggering of an adaptive pathway.

We have used the WRSE pathways in our WRMP. For the first five years the adaptive pathways in our draft plan start with local authority housing plans, moderate climate change impacts and low impact environmental sustainability reductions on existing supplies. In 2030, for the second five years of the plan, three scenarios are identified which explore the impact of alternative housing forecasts. From 2035 onwards the full range of alternative futures are shown through higher and lower climate change and environmental impact scenarios as shown in Figure 9 below.

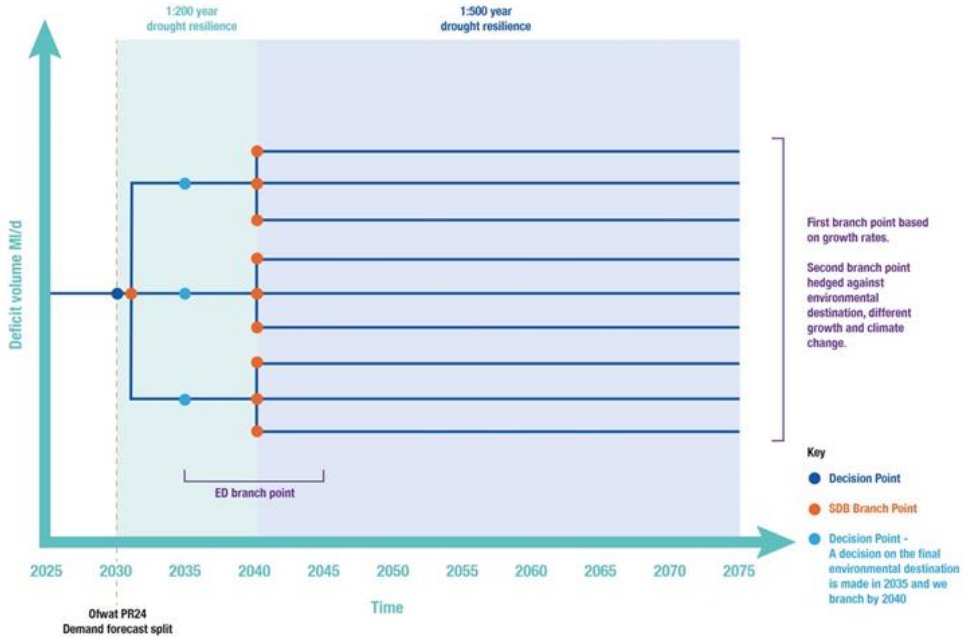


Figure 9: Adaptive planning branches used to develop our rdWRMP24.

In all nine adaptive situations (pathways), our baseline supply demand balance starts in deficit as shown in Figure 10 for the dry year annual average (DYAA) scenario and Figure 11 for the dry year critical period (DYCP) scenario. In 2031-32 the supply demand balance improves significantly when the Havant Thicket Reservoir becomes operational and as existing bulk supply contracts end. This supply demand balance excludes any drought interventions we may take as these are considered as an option in the WRMP.

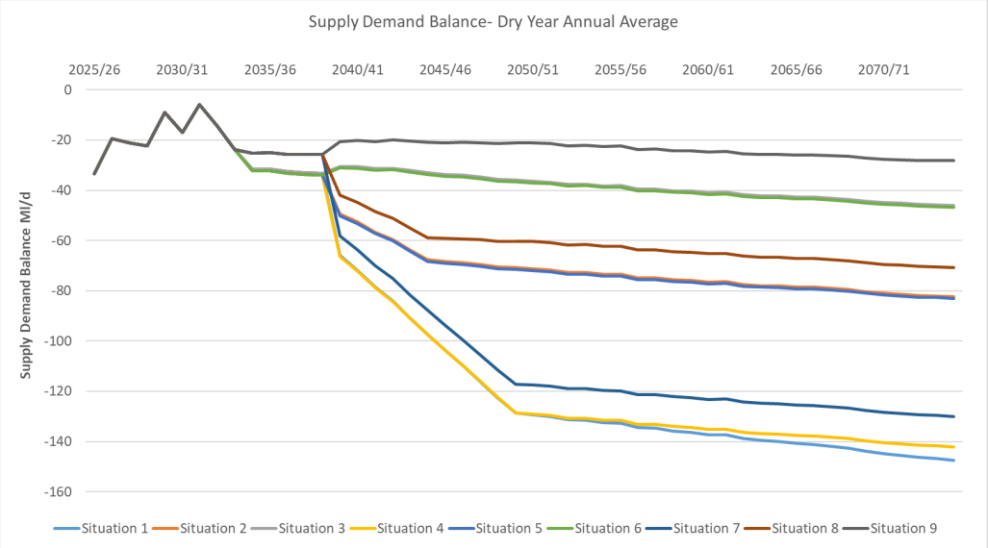


Figure 10: Baseline Supply Demand Balance (shown in Ml/d) for each of the nine adaptive planning Situations (in dry year annual average conditions)

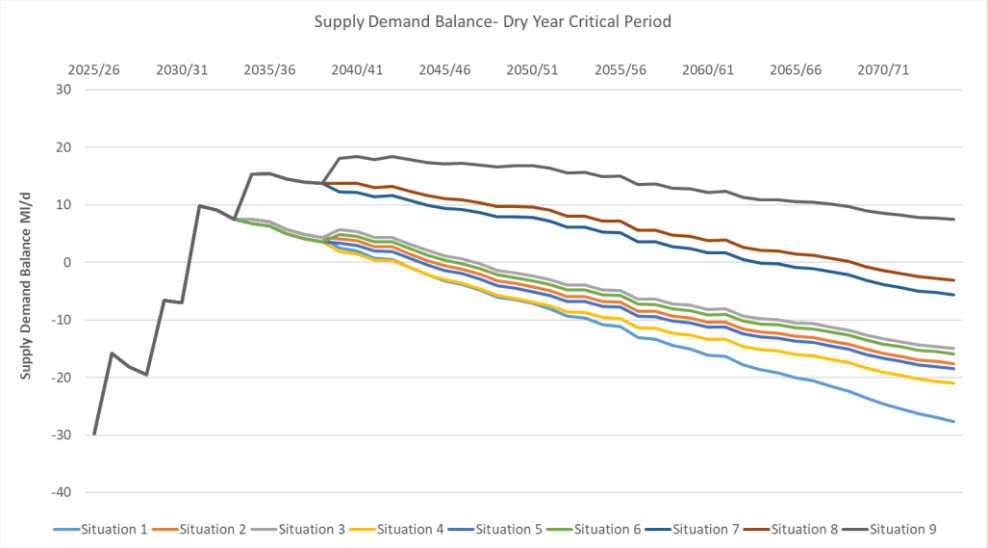


Figure 11: Baseline Supply Demand Balance (shown in Ml/d) for each of the nine adaptive planning Situations (in dry year critical period conditions)

Note that although nine scenarios and therefore nine supply demand balances have been produced by the regional investment modelling, two are not differentiated for Portsmouth Water. This is because two of the situations apply directly to increased demands associated with implementation of the Oxford to Cambridge (Ox-Cam) Arc. This is a cross-government initiative to support development across the five counties of Oxfordshire, Bedfordshire, Buckinghamshire, Cambridgeshire and Northamptonshire up until 2050. It drives significant demand for some companies in WRSE but does not affect us directly. It is possible that water scarcity driven by this development might impact our options indirectly.

During a dry year, the supply demand balance is more challenging under the annual average scenario (DYAA) than under critical peak (DYCP) conditions. Therefore, it is the dry year annual average planning condition that drives our investment need and has been used as the basis for modelling the best value plan.

If we experience a different future scenario from the one we are planning for in our plan reported pathway, we will need to move to an alternative pathway. We have included

decision points where we will decide if we need to change course. If we do there will then be a branching point at which we'll move to the appropriate pathway.

There are three main factors that would require us to change pathway.

- **Population growth** - This will impact future demand for water. We have included a decision point in 2030 where we will assess whether the growth in population and the updated population forecasts are in line with our plan reported pathway. If it is above what we assumed and we need extra water, we'll move to an alternative pathway with additional investment. If it's less, we will move to a pathway where less future investment is required.
- **Environmental improvement** - The level of abstraction reduction will impact how much water is available to supply. We have included a decision point in 2035 following the completion of the environmental investigations that will take place from 2025 via the WINEP. These will determine how much water companies will need to reduce their abstractions by, to deliver environmental improvement by 2050. If this differs from our plan reported pathway, we will move to the appropriate alternative pathway in 2040.
- **Climate change** - The impact of climate change will also affect how much water is available to supply. Again, we may need to move to an appropriate alternative pathway in 2040.

The regional plan will be updated every five years to inform the water companies' future WRMPs. The trigger points we have included align with the completion of the five-year business plans that should include the investment needed for the pathway we are following. Since the dWRMP24 we have published a new monitoring plan which details the key metrics we will track and monitor. This is covered in Section 0 of the main statutory plan.

For planning purposes, we have had to nominate a single 'reported pathway' as our preferred scenario. This pathway, a single path through these branches of possible futures, represents a scenario that satisfies regulatory requirements. We have used this reported pathway to complete the data tables associated with our WRMP24.

However, that's not to say there is a larger probability of the reported pathway future becoming reality than the probability of other branches in the adaptive plan. Therefore, we have costed and are aware of the interventions necessary to deliver our service to customers should any of the possible planned futures occur.

Our reported pathway is known as 'Situation 4' within the WRSE investment model and is the common pathway selected across the whole of WRSE.

Engagement and consultation

Introduction

We pride ourselves on being a community focused water company. Understanding the needs of our customers and stakeholders is important to us, especially when thinking about decisions for the future. We take an evidence-based approach to put the views of our customers and stakeholders at the heart of shaping our business and the way we operate.

Engaging with our customers, regulators, and other stakeholders has enabled us to incorporate their expectations and priorities right at the start of this planning process. Our engagement activities have been designed to inform both the WRMP and our Business Plan (PR24).

Some strands of our customer and stakeholder engagement continue and build on our previous initiatives, whereas other aspects are new. The WRMP24 is collaborative to its core, with many fundamental building blocks of this plan having shared methodologies. We have

actively participated in the new and wider engagement activities undertaken within the regional plan through WRSE and with the National Framework through RAPID and the Strategic Resource Options (SROs).

Customer research

We commissioned research into customer priorities for water resources, long term supply-demand choices, and investment decisions. This research has guided our options selection, has acted as a check on the modelling outputs of the WRSE regional investment modelling and is also informing our PR24 Business Plan.

To build on existing knowledge and evidence and to determine where customer research would be most useful, we first analysed over 30 existing reports for common themes and existing evidence.

Customers participated in focus groups and surveys to investigate specific topics, such as customer views on metering and future developments to Havant Thicket Reservoir.

Our customers have told us they strongly support the reduction of leakage and there was also good support for encouraging customers to use less water. Furthermore, of the 700 self-selected panellists in a March 2022 online panel survey, 45 per cent 'strongly support' and 28 per cent 'tend to support' universal metering. Whilst there was good support for construction of Havant Thicket reservoir, there was less support for increasing supplies through desalination, recycling treated wastewater and water transfers.

Wave 4 of 'Water Talk', our consumer panel took place between 13th and 30th January 2023. 434 Portsmouth Water bill payers who are part of the 'Water Talk' panel took part in an online multiple-choice survey. The outcomes indicated overall strong support for the dWRMP24 with 89% of respondents supporting the plan.

The views of customers about the challenges we face are included in Section 1. Customer preferences on specific options are included in Section 7 and have informed a metric which has been used to develop the plan as described in Section 8.

WRMP Pre-consultation

Some parts of this plan have been developed at company level, and others at regional level. It has been appropriate that the engagement informing development of this plan has happened both directly with our customers, and as part of the regional WRSE group.

As part of the formal dWRMP24 pre-consultation, we wrote to regulators and stakeholders to inform them about our process, approach, and draft emerging results. We also consulted on an SEA scoping report.

Our pre-consultation letter was sent to the Statutory consultees named in the WRPG, and also to individuals and organisations who had previously engaged with our Drought and/or Water Resources Management Plans, or the development of the Havant Thicket Reservoir. We also invited all Retailers and New Appointments and Variations (NAVs) to participate in our pre-consultation.

Generally stakeholders were supportive of the approach. Section 3 of our plan includes further details on their feedback.

Ofwat wanted to reiterate their expectations for the planning process, while Environment Agency comments were focussed on the detail around specific options. We subsequently carried out an enhanced pre-consultation with both Ofwat and the Environment Agency

discussing how each of their comments had been considered and had shaped the development of this plan. Examples of the changes made are:

- The adjustment of the adaptive planning branch points.
- Inclusion of an additional growth scenario to reflect new Ofwat guidance.
- The selection of a reported pathway that assumes a high level of environmental protection by 2050 to meet Environment Agency expectations.

We also had dedicated pre-consultation discussions with Natural England, where Local Nature Recovery Strategies were discussed, and a separate pre-consultation meeting with the Drinking Water Inspectorate (DWI) to identify our key options.

We also incorporated discussions about the approach we were taking to develop the dWRMP24 into our existing conversations with other stakeholders. Examples of this include our participation with the Arun and Western Streams catchment partnership group, our discussions with Friends of the Ems and in stakeholder groups interested in the development of the Havant Thicket Reservoir.

WRMP public consultation

On 15th November 2022 we published our dWRMP24 for consultation. The public consultation ran for a 12-week period and closed on 20th February 2023. We would like to thank all the individuals who shared their views, and the views of organisations they represent, during this public consultation.

We invited people to feed back on our dWRMP24 through a variety of routes. This was with the aim of reaching out to and engaging with as many people as possible. Receiving feedback through several routes provided the opportunity to compare and validate the findings across the different research methods, giving us greater confidence that we were correctly understanding the views of our stakeholders and customers.

To ensure our plan was accessible to a wide range of stakeholders and customers, we produced a non-technical stakeholder summary, alongside the plan and more technical supporting appendices, and made this available to be viewed and downloaded on our website.

As well as welcoming written consultation responses, to encourage wider engagement we encouraged people to use a survey hosted on our website. We also promoted the consultation on social media.

A number of these consultation activities were undertaken in partnership with Southern Water due to the high interconnectivity of customers and interrelationships between the WRMPs of both water companies.

Other activities were carried out at regional level as part of the WRSE group who ran a consultation in parallel with our own, consulting on the draft best value regional plan for water resources across the South East region.

In total, we received 708 individual responses to our dWRMP24 consultation from customers and organisations. These consisted of 159 emailed text responses, in addition to multiple choice data from 434 customer panel surveys and 115 website surveys that contained both multiple choice questions and the opportunity to add commentary text. We accepted and included responses received after the end of the consultation deadline.

The data within the surveys was largely quantitative. This enabled us to look across the responses to compare trends and the most common views about the topics we asked about. Comparing responses to topics that were asked about in both the customer panel (the

"Barometer") and the website survey gives confidence in the validity of the results. We used the overall findings and trends shown in these survey results to influence the continued development of our WRMP24.

There was an opportunity at the end of the website survey for respondents to provide any other thoughts and comments they wanted to share with us. Of the 115 website surveys completed, 79 respondents chose to provide written commentary in the text box available and these comments were considered in the same way as other written consultation responses received through emails.

The written consultation responses provided detailed insight into the views of customers, regulators, and stakeholders about specific areas of our dWRMP24. We read each of these and identified 1,292 separate comments within the text received.

Each of these 1,292 comments was individually reported along with our response to it and resulting changes to our WRMP in a Statement of Response document that was published alongside our rdWRMP24.

Overall support for our plan was high, with customers largely supportive of demand and leakage reductions and the balance between supply and demand options. Customers and stakeholders expressed concerns regarding Southern Water's Hampshire Water Transfer and Water Recycling Project (HWTWRP). Further information is presented in 'What is our best value plan' section.

Regional collaboration and shared pre-consultation activities

Engagement with our neighbouring water companies, and more widely across the region, has been fundamental to development of this plan. We have developed regional options, collectively consulted on an emerging regional plan, and co-created shared approaches and methodologies.

Through the WRSE group, we engaged in regular dialogue with regulators and stakeholders as well as consulting widely on method statements as they were developed and adopted as well as pre-consultation on the emerging regional plan.

We have actively encouraged our stakeholders to engage with the development of the regional plan through webinars, presentations, and consultation documents on the development of the policies, technical methods, solutions and programme appraisal.

WRSE produced a Stakeholder Engagement Report which summarised the extensive engagement and consultation activity that has taken place to date. The report was published alongside the emerging plan in January 2022 and contains further details of the 40-plus engagements held to date, including sessions with local authorities, retailers, 'Blueprint for Water', National Infrastructure Commission, National Farmers Union (NFU) and the Horticultural Traders Association.

This regional engagement has been particularly successful in understanding views on topics that affect several water companies, for example the Southern Water options that interact with Havant Thicket Reservoir.

An example of where pre-consultation has directly influenced the WRMP24 was the introduction of earlier risk-based variations triggered by population growth, environmental destination and climate change forecasts compared to the WRSE emerging plan consulted on in spring 2022. The selection of adaptive planning Situation 4 as the dWRMP24 and final WRMP24 reported pathway across the South East region is another example of how regulatory engagement has contributed to key decisions taken during this process.

What is in our Best Value Plan

Our preferred best value plan

Our plan resolves the supply demand deficit identified in our baseline supply demand balance using a selection of the feasible options we identified. We consider the plan to represent a best value plan and not solely a least cost plan. We have a solution for all nine branches of the adaptive pathways but have completed our data tables using our reported pathway (also known as 'Situation 4').

This pathway is based on local authority housing plans, CC06 (higher) climate change forecasts and prepares for a high level of impact on our existing supplies to deliver environmental ambition, including a cap on existing abstraction licences at recent actual levels.

Our revised draft preferred best value plan consists of the following components:

- **Starting in 2025–26**: Implementation of the 'High Plus' basket of demand management measures which aims to reduce leakage by 50 per cent by 2040 and overall customer demand for water by around 26 per cent by 2050 compared to 2021–22 levels. This basket of measures includes universal household and non-household 'smart' metering over 10 years starting in 2025–26. Existing 'dumb' meters will also be either upgraded or replaced with smart meters, ensuring that to the extent that it's practically achievable, by 2035 every household and non-household meter will be smart. By 2034–35 we expect that 94.7 per cent of the households we serve will have a meter, compared with 34 per cent in 2021–22. Installing 'smart' meters will deliver additional benefits to reducing water demand, as the data from the meters will help reduce leakage inside and outside properties and improve the quality of our customer engagement. These demand reductions are profiled to aim to meet the EIP targets for demand reductions for leakage, households and non-households.

  To optimise the effectiveness of our own water efficiency efforts, our best value plan assumes that the Government will introduce mandatory water labelling for white goods and strengthen water regulations standards to improve water efficiency in homes. This assumption has been applied consistently across the WRSE regional planning area and discussed with regulators. Other key assumptions and outcomes include:

- **From 2025-26 and 2038-39:** Our levels of service for Emergency Drought Orders (i.e. rota cuts) will remain at 1-in-200 during this period, increasing to 1-in-500 from 2039 onwards. This increases the deployable output available to us during this period.

- **From 2025–26 until 2040–41**: When required in extreme events, the continued use of existing drought schemes in accordance with our drought plan (Temporary Use Bans, Non-Essential Use Bans and our supply-side Source S drought permit). Beyond 2040-41 the Source S drought permit is no longer used, although the implementation of Temporary Use Bans and Non-Essential Use Bans is continued.

- **From 2025–26**: Continued provision of existing and planned bulk supplies to Southern Water, including from Havant Thicket Reservoir. This involves providing up to a 15 Ml/d transfer to Southern Water at our eastern border and providing up to a 15 Ml/d transfer to Southern Water at our western boundary from 2029, rising to a 51 Ml/d capacity transfer by 2031-32 (once Havant Thicket Reservoir becomes online). The actual transfer rates vary throughout the planning horizon depending on the amount of water we have available for transfer and the needs of Southern Water. Since the dWRMP24 we have agreed with Southern Water to minimise exports in a normal

(non-drought year) in order to minimise abstraction from our chalk aquifers to reduce the risk of Water Framework Directive related deterioration in water body status.

- **By 2034**: A network enhancement to improve the way we can move water resources around our supply area (unlocking conjunctive use benefits associated with Havant Thicket Reservoir, once operational). This option was also selected in the dWRMP24.

- **By 2040:** A bulk import of potable water from Southern Water to the west of our supply area. This represents a reversal of flow in the existing and planned bulk supplies to Southern Water. Once Southern Water has more water in Hampshire through the delivery of a supply development detailed within the WRSE revised draft regional plan and Southern Water's WRMP24, we would be able to start receiving supplies from Southern Water to support our own supplies in future. This option was also selected in the dWRMP24 but is now selected around 8 years earlier.

  The South East Strategic Reservoir Option (Sesro) provides water to Thames, Southern and Affinity in the WRSE regional best value plan during different conditions. We also get an indirect benefit from Sesro in the preferred plan, as we become a net importer of water from Southern, who in turn get their water from a combination of Sesro (via the Thames to Southern transfer) and the Hampshire Water Transfer and Water Recycling Project (HWTWRP).

- **From 2047 onwards:** Further into the planning period there is a need for further interconnectivity and treatment capacity to transfer and treat water across our supply area to utilise the water most effectively from Havant Thicket Reservoir. In the dWRMP24 these options were not selected in the preferred pathway but now feature in the preferred plan due to the need to find additional water resulting from higher sustainability reductions.

  The plan suggests the scale of this need would require up to 20 Ml/d of additional treatment works capacity at Works A WTW from the mid to late 2040s and a new 10 Ml/d WTW at the location of service Reservoir C from the early 2050s. These options are predicated on the prior construction of the proposed HWTWRP scheme for Southern Water.

  To support this extra demand the plan suggests the reservoir could need additional recycled water to be added, meaning the water taken would be blended reservoir water (i.e. with contributions from rainfall, recycled water and spring water). Portsmouth Water will seek to remove this dependency in the next water resources management plan (WRMP29) via the consideration of new options (for reasons set out in the next paragraphs), although the need for recycled water in a drought is expected to remain.

Our WRMP24 plan is reliant on Southern Water's forecast demand reductions (which would allow them to provide a future bulk supply to us) and the development of their HWTWRP which would allow us to abstract and treat more water from Havant Thicket Reservoir in the future.

From the consultation responses, we understand that some customers have concerns about Southern Water's HWTWRP which forms part of Southern Water's WRMP24. We take these concerns very seriously and value the trust of our customers and stakeholders. We have committed initial support to Southern Water as they develop the details of this option; however, we will withdraw our support to the scheme if we have any doubt over the safety of this water, or the impact it might have on the environment and leisure facilities at Havant Thicket Reservoir. We will also consider the views of our customers and local stakeholders in the review of our support of the option. Further information can be found in Section 7.8 of the main statutory plan.

In addition to the above components, a WINEP programme will take place in two phases over the first 10 years of our WRMP24 (with the majority of investigation being between 2025 to 2030), including environmental assessments for all the river catchments in our supply area, to ascertain the extent of any capping of our abstraction licences necessary to deliver improvements to the environment (our environmental destination). Developing the evidence base will quantify the scale of reductions required to our current sources of supply to achieve 'good' environmental status of the water bodies in our area. There is a possibility that less demanding abstraction reductions could be required following these 'no deterioration' studies and these would inform future WRMPs. The scale of future sustainability reductions (our environmental destination) is a key driver of the level of investment needed to meet potential future deficits.

This WRMP24 fully aligns with the outcomes of the WRSE revised draft regional plan and also with the stated preferences of our customers in engagement work we have undertaken to date both through the WRSE and directly.

Regional context

Our draft best value plan not only supports our own future challenges, but also supports a resilient reliable water resources solution for the South East region.

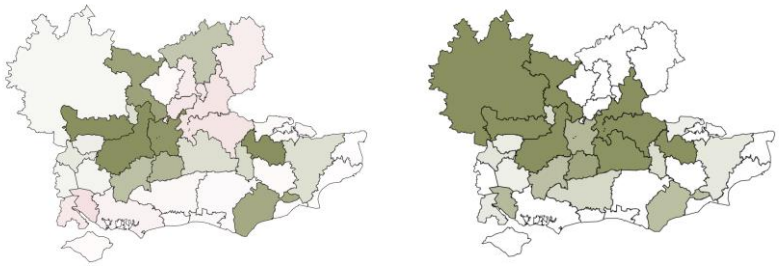
The following regional maps (Figure 12) show the scale of the supply demand balance in Ml/d before and after the WRMP24 options have been implemented. Red shades indicate a deficit in the supply demand balance and green shades represent a surplus.

The maps show no residual deficit remaining in the Portsmouth Water supply zone following the implementation of the interventions outlined in our WRMP24.

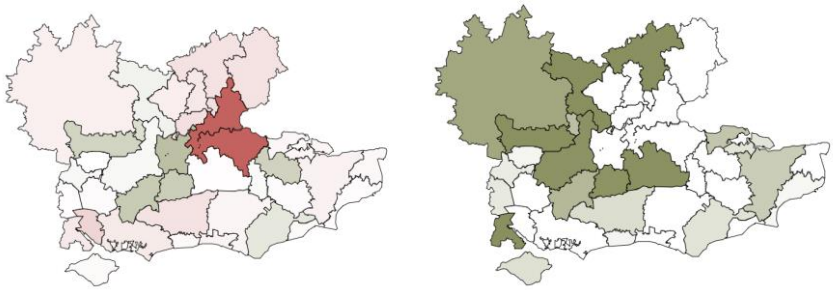
Key to the regional supply demand balance, by water resource zone in Ml/d.

-350	-300	-250	-200	-150	-100	-75	-50	-25	-10	-5	0	5	10	25
-350	-300	-250	-200	-150	-100	-75	-50	-25	-10	-5	0	5	10	25

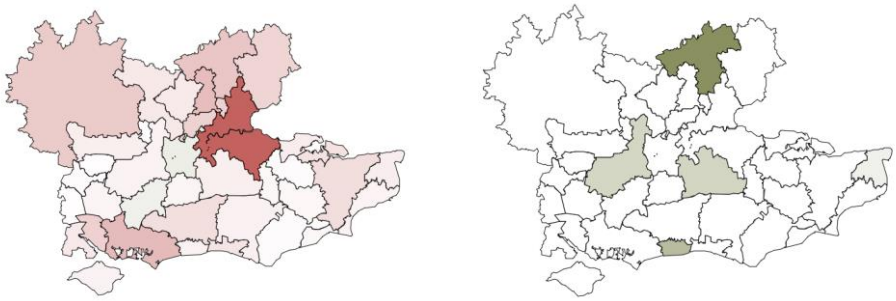
Baseline & final supply demand balance for all pathways (DYAA) for 2025–26



Baseline & final supply demand balance for the reported pathway (DYAA) in 2035–36



Baseline & final supply demand balance for the reported pathway (DYAA) in 2049–50



Baseline & final supply demand balance for the reported pathway (DYAA) in 2074–75

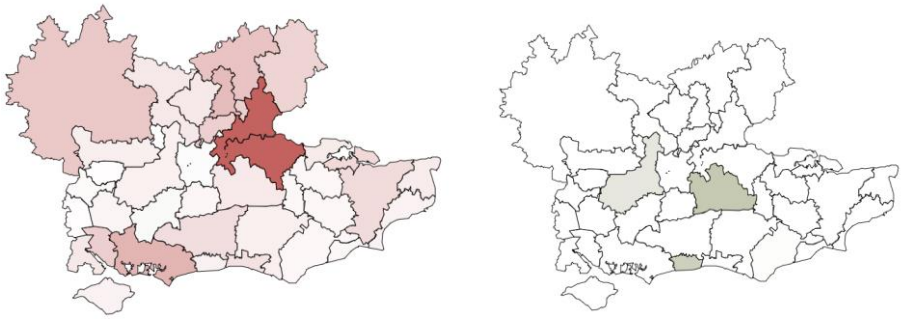


Figure 12: Regional baseline and final supply demand balance by supply zone across the South East region for DYAA

Adaptive planning and strategic alternatives in our revised draft best value plan

Through the process of adaptive planning and considering strategic alternatives to our WRMP24, we considered the modelling outputs of all nine adaptive planning pathways, and a variety of optimisations to consider both what plans would look like if it was optimised on least cost, or on producing the best environmental and social metrics.

Comparing outputs for all nine adaptive pathways, our WRMP24 is resilient and largely unchanged across the variety of adaptive planning situations considered. The implementation dates of interventions and options we need to deliver under the nine adaptive planning branches are shown in Table 3. The lack of variation of dates shows that for us the branches do not make a significant difference to our investment needs.

Table 3: A comparison of when options are triggered to resolve each of the nine adaptive planning situations

	WRSE adaptive planning situations (DYAA)								
	S1	**S1**	**S3**	**S4**	**S5**	**S6**	**S7**	**S8**	**S9**
Portsmouth Water Demand Basket 'High Plus'	2026	2026	2026	2026	2026	2026	2026	2026	2026
Network upgrade	2034	2034	2034	2034	2034	2034	2034	2034	2034
Bulk import of potable water from Southern Water (Otterbourne WSW to Source A)	2040	2040	-	2040	2040	-	2042	2063	-
Continuing drought measures until 2041									
Levels of service for Emergency Drought Orders (i.e. rota cuts) will remain at 1-in-200 during this period, increasing to 1-in-500 from 2040 onwards									
Drought Permit: Source S	2026	2026	2026	2026	2026	2026	2026	2026	2026
Non-Essential Use Ban (NEUB)	2026	2026	2026	2026	2026	2026	2026	2026	2026
Temporary Use Ban (TUB)	2026	2026	2026	2026	2026	2026	2026	2026	2026
Works A treatment upgrade and transfer capacity enhancements[8]	2047	-	-	2047	-	-	2040	2044	-
Service Reservoir C treatment works and transfer capacity enhancements[6]	2050	-	-	2050	-	-	-	-	-

[8] Options are linked to maximising water use from Havant Thicket Reservoir

Cost

Figure 13 shows the total expenditure of the regional Best Value Plan driven by each of the nine adaptive planning branches (in Net Present Cost (NPC) terms). The more costly situations to resolve are defined by high climate change impact and high impact of sustainability reductions and licence capping to meet environmental destination objectives.

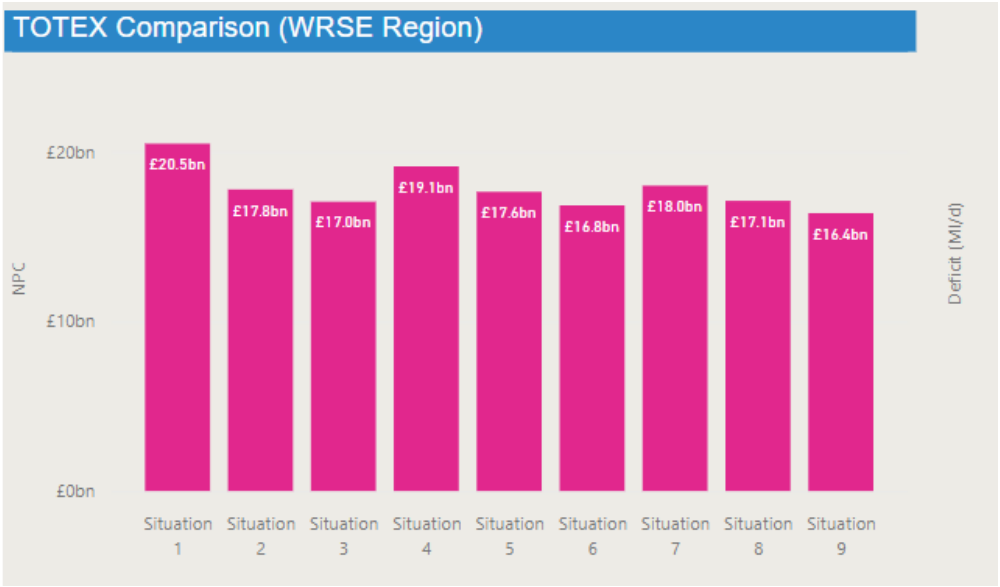


Figure 13: Total Expenditure (Totex measured in Net Price Calculation) for Best Value Plan modelling for Dry Year Annual Average conditions of all nine adaptive planning situations (for the WRSE region)

The total expenditure for our preferred Best Value Plan reported pathway ('situation 4') is £604m, and the total expenditure for the other adaptive planning branches ranges between £419m and £612m between 2025 and 2075.

The total expenditure for the Least Cost Plan (and 'situation 4') is the same as the Best Value Plan for the first 15 years of the plan. Further information on the cost of alternative plans is provided in the supporting WRMP24 planning tables.

For our rdWRMP24 we estimated that our 50-year preferred Best Value Plan will add around £5.20 per year on average to bills in 2025/26, rising to £15.42 in 2029/30, increasing to £40.90 by 2050. This is compared to our current average bill of £117 per year. These figures are subject to change because of the ongoing PR24 process.

Quality Assurance and Board Approval

We developed elements of our WRMP24 in-house. The Board also approved the appointment of expert third parties to undertake preparation of certain parts of the WRMP and approved the development of other parts of the WRMP to be carried out in regional collaboration. This is shown earlier in Figure 4.

The data input into the WRMP was checked and reviewed internally with additional peer reviews and assurance points at key points to ensure the quality of work produced and its compliance with the WRPG. Figure 4 shows the aspects of our WRMP24 that have been audited and assured.

The Board considered assurance reports from Jacobs, our Technical Assurance provider on the WRMP24. The reports checked:

- that we have met our obligations in developing our plan.
- that our draft plan incorporated the long-term government requirements for leakage and demand reduction.
- that our draft plan aligns with the WRSE regional plan and that it has been developed in accordance with the national framework and relevant guidance and policy.
- that the WRMP and PR24 planning assumptions are consistent.

These assurance reports are included as Appendix 11A to this WRMP24.

The Board also considered the views of the WRMP24 Steering Group. This was a group of Key internal stakeholders from across the business who met monthly throughout the development of the WRMP. The purpose of the Steering group is as follows:

- To ensure the visibility and buy-in of the WRMP24 development and decision-making process to key representatives within our company
- As a quality assurance measure
- To provide robust challenge to the WRMP24 process
- To review progress, issues and key programme risks
- To approve and document key business decisions
- To escalate specific decisions to the Executive and Board where appropriate
- To provide confidence to the Executive and Board when it comes to their sign off of the WRMP24
- To provide the linkages between the WRMP24 process and wider business functions, including Business Planning for PR24 and net zero - so that the outputs of WRMP24 are fit for purpose going forward into the Business Plan.

The WRMP24 Steering Group is included as Appendix 11B.

Board Assurance Statement

The Board have been actively engaged in the development of this WRMP through;

- Setting the company's vision and strategy.
- Regular review sessions with individual Board members and the full Board at key development stages.

The Board has put in place both internal and third-party technical assurance to ensure the quality of this WRMP.

Having reviewed the WRMP and considered the assurance reports from Jacobs, our Technical Assurance provider, the Portsmouth Water Board can confirm:

- we have met our obligations in developing our plan.
- our plan incorporates the long-term Government requirements for leakage and demand reduction.
- our plan aligns with the WRSE regional plan and that it has been developed in accordance with the national framework and relevant guidance and policy.
- that the assumptions in the WRMP are consistent with the PR24 planning assumptions.
- our plan is the best value plan for managing and developing our water resources in order to allow us to continue to meet our obligations to supply water and protect the environment.

- the plan is based on sound and robust evidence, including that relating to costs.

This plan addresses the comments received through the consultation, and we endorse this plan as the most cost-effective and sustainable long-term solution, making a major contribution to resilient water supplies in the South East for the future.

1 OVERVIEW

1.1 Introduction

It is a statutory requirement under the Water Industry Act 1991 for water companies to produce a Water Resources Management Plan (WRMP) every five years to help ensure customers and communities have adequate water supplies available. Our WRMP sets out in detail how we will provide and develop an affordable and efficient water supply for our customers, improving the resilience of water supplies to droughts and other future challenges, whilst also protecting the environment.

For this Water Resources Management Plan 2024 (WRMP24) we have planned for the 50-year period from 2025–26 to 2074–75. The steps of the statutory process that must be followed in preparing a WRMP are set out in Figure 14.

A 50-year planning horizon has been selected in line with WRSE to ensure that any large strategic schemes required beyond 2050 are identified. These large strategic schemes can require a significant lead in time and therefore assessment beyond 2050 can help to identify potential future investment needs for Portsmouth Water and the wider WRSE group.

Engagement and consultation have contributed to the development of the WRMP24. A draft emerging plan, along with method statements, was shared and discussed with our regulators and interested stakeholders. We also advertised for suggestions of options to help increase supply or decrease demand. We sent a pre-consultation letter inviting comment and feedback from 169 representatives of regulators, NGOs, Councils and interested groups. Dedicated pre-consultation discussions were held with three regulators – the Environment Agency (EA), Ofwat and Natural England (NE) – and targeted customer research into priorities and preferences was also undertaken by Blue Marble.

On 15th November 2022 we published our draft Water Resource Management Plan 2024 (dWRMP24) for consultation. The public consultation ran for a 12-week period and closed on 20th February 2023. We would like to thank all the individuals who shared their views, and the views of organisations they represent, during this public consultation.

As well as updates in response to the consultation comments we received, our WRMP24 includes updated outputs and data from the WRSE regional modelling in relation to:

- population and growth forecasts to reflect updated data not available previously,
- demand forecasts to reflect the above, and updating the base year for forecasts,
- data and information on individual options, including option timing, costs and best value metrics, and option availability,
- demand management options, including commitments to leakage and PCC targets considering Government policy expectations, including in the Government's Environmental Improvement Plan, and
- other data updates to reflect new data availability.

This final WRMP24 represents the last step in the collaborative process of developing our WRMP24. It is published in line with Step 18 of Figure 14 below, with the permission of the Secretary of State (SoS). We will now move into a cycle of reviewing our plan on an annual basis under Step 19.

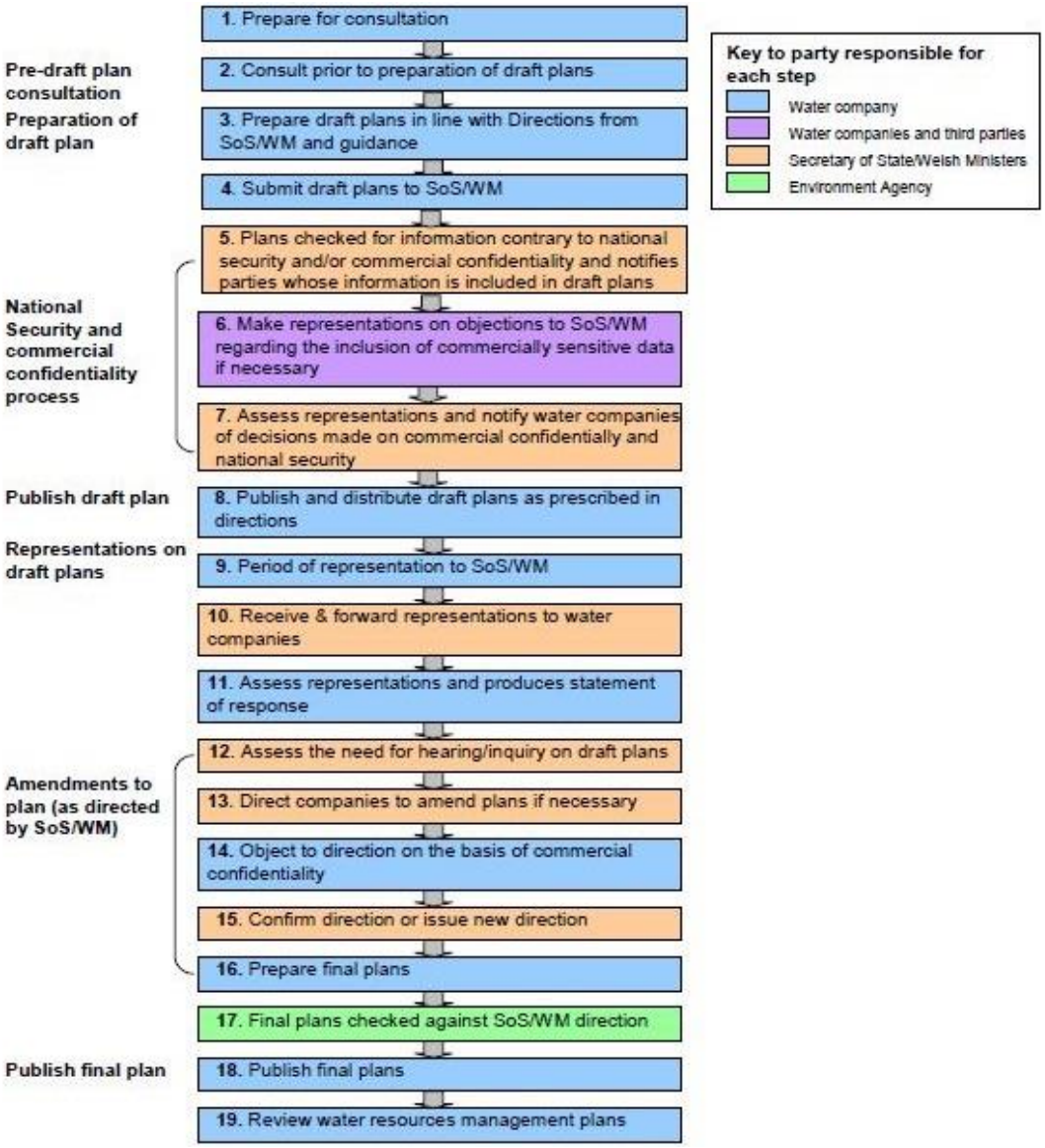


Figure 14: Process for developing a WRMP (Source: WRPG, EA, NRW, Ofwat, Defra and Welsh Government, 2018)

This WRMP24 is our most ambitious yet.

This ambition reflects the scale and complexity of the water resources challenge facing us. This challenge directly resulted in Defra's acceptance of the Environment Agency's July 2021 recommendation that our supply area should be reclassified by the Environment Agency as being 'seriously water stressed'. This classification formally acknowledges that without appropriate investment, there is a risk that the service customers receive for their water supplies could be significantly affected. This classification has allowed us to consider the option of implementing a universal metering programme across our household customers. Other companies across the South East who were already designated as areas of serious water stress have implemented, or are in the process of implementing, metering to their domestic customers, and have shared evidence of domestic demand savings of between 13 and 18 per cent.

Building on our previous water resources management plan, WRMP19[9], this WRMP24 has been developed in compliance with regulatory guidelines and government preferences. It adopts new data sets and methodologies, and accounts for the recent social and economic shifts we have experienced since the last planning cycle. Additionally, it reflects the latest thinking around key considerations such as climate change mitigation and adaptation, working towards Net Zero carbon, and protecting the water environment by delivering against a stated environmental destination for 2050.

In March 2020 the Environment Agency launched the National Framework for Water Resources, aspiring to leave the environment in a better state than we found it while improving the nation's resilience to drought, and minimising interruptions to water supplies. This took on board many of the recommendations from the 2018 National Infrastructure Commission (NIC) 'Preparing for a Drier Future' report, such as improved drought resilience and strengthened regional planning.

The National Framework for Water Resources set out the need for regional water resources planning – captured in Regional Water Resilience Plans - to overcome the national challenges of securing public water supplies, population growth, food security, climate change, protecting the environment, and power generation.

We are members of the Water Resources South East group (Figure 15).

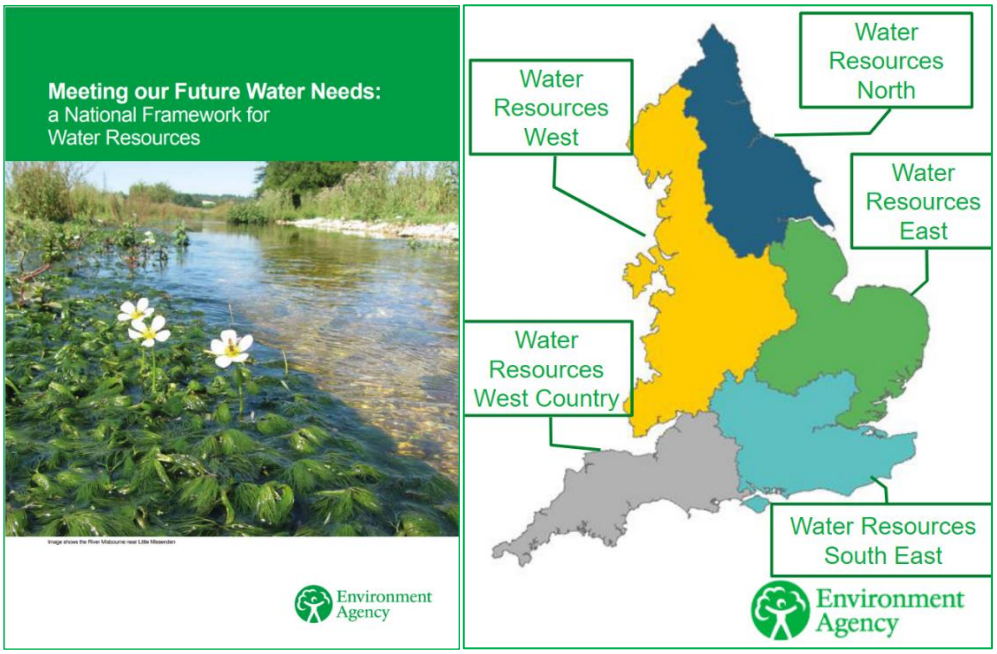


Figure 15: The National Framework for Water Resources has been a major influence for this WRMP24. This Framework sets out a case for regional water resources groups developing regional multi-sector resilience plans to inform WRMPs.

In addition to establishing a requirement for regional plans to inform the company WRMPs, the National Framework for Water Resources set out some core objectives. These included;

- Reducing the amount of water people use to 110 litres of water per person per day by 2050,

[9] In December we published our Revised WRMP19 (Dec 2022) and where relevant we have updated comparisons to WRMP19 accordingly. This Revised WRMP19 (Dec 2022) is referred to as WRMP19 throughout this document.

- Driving down water use across all sectors, halving leakage rates by 2050 (against a baseline of 2017–18) and
- Reducing the use of drought measures that have an impact on the environment.

In January 2023 the Government published its Environmental Improvement Plan (EIP). This is the first revision of the 25 year Environment Plan. One of the ten Goals presented in this plan was, 'Goal 3: Clean and plentiful water'. The following three targets and commitments (page 99 of the EIP) directly influenced revisions to our WRMP:

- Reduce the use of public water supply in England per head of population by 20% from the 2019 to 2020 baseline reporting figures, by 31 March 2038, with interim targets of 9% by 31 March 2027 and 14% by 31 March 2032.
- Water companies to cut leaks by 50% by 2050, with interim targets to reduce leakage by 20% by 31 March 2027 and 30% by March 2032.
- Target a level of resilience to drought so that emergency measures are needed only once in 500-years.

To support delivery of the EIP the Government committed to rolling out a new water efficiency labelling programme and delivering the ten actions set out in the Roadmap to improve Water Efficiency in new developments. Our ability to meet the challenging per capita requirements is reliant on the successful and timely roll-out of these government initiatives.

Water Resource Planning Guideline

The Environment Agency's Water Resources Planning Guideline (WRPG), originally published for this round of planning in February 2021, requires us to:

- Ensure that water supplies move from being resilient to an event we might expect to see once in every 200 years (i.e. a 0.5 percent chance of happening each year) to being prepared to provide a reliable supply in a drought event we might expect to see once in every 500 years (i.e. a 0.2 percent chance of happening each year).
- Present an environmental ambition with potential short, mid and long-term reductions in supplies to protect our environmentally important chalk sources and therefore identify associated investment for new interventions to enable us to continue to meet customer demand for water in future.
- Incorporate the uncertainty associated with the impact of Covid-19 on customer demand for water in the future.

After the dWRMP24 was published for public consultation in January 2023, the Environment Agency issued a revised draft WRPG for WRMP24 and asked water companies to comment on the proposed changes. We submitted our comments through a shared WRSE regional response and in April 2023 the Environment Agency published the final updated version 12 of the WRPG.

The following bullet points provide a high-level summary of the changes to regulatory expectations and the implications of these for our WRMP:

- A more ambitious government expectation for a household per capita consumption (PCC) delivery target of 110 l/h/d by 2050 at a water company level under the dry year annual average (DYAA) planning condition.
- A challenge to bring forward environmental destination delivery.
- A challenge to deliver resilience to a 1-in-500 drought event before 2039-40.
- A 9 per cent reduction in non-household water demand by 2037/38 from a baseline of 2019-20 and a 15 per cent reduction by 2050.
- Request for utilisation rates for options that are selected as part of our preferred plan.
- Additional environmental assessment criteria for 'Significant Effects'.

- Expectation that water companies will produce an appendix reflecting how it has considered its experiences of the unprecedented temperatures and associated peak demands from summer 2022.

As a result of this updated regulatory guideline, we have made several changes to our WRMP since the draft was published, including the addition of a new appendix providing information about 2022 drought event and increasing our ambition to encourage the reduction of household demand for water across our supply area by aiming to achieve it in dry years as well as in normal years.

Another core ambition within the National Framework for Water Resources was to "move water to where it's needed through more transfers of different scales and lengths". The Regulators' Alliance for Progressing Infrastructure Development (RAPID) was set up to progress this ambition in parallel with the new regional planning initiative and to feed into the statutory WRMP planning process.

RAPID is an alliance of Ofwat, the Environment Agency and the Drinking Water Inspectorate (DWI). It was established in 2019 to engage with the regional planning process to support work to develop and select the best solutions and prepare their path for delivery starting in the next price review period (2025–2030). It specifically aimed to facilitate nationally significant strategic infrastructure schemes, such as solutions that improve interconnectivity between company and regional supply areas.

The RAPID programme is supporting the development of 18 solutions through a gated review and challenge process (Figure 16). At the end of each gate, if an option is no longer considered to merit further investigation, then the investigation of that option is stopped. One of these 18 solutions is a direct transfer from Havant Thicket Reservoir, in our area, to Southern Water's supply area. To find out more about these strategic schemes and the regulatory process they are following, visit The RAPID gated process – Ofwat.[10]

[10] www.ofwat.gov.uk/regulated-companies/rapid/the-rapid-gated-process/

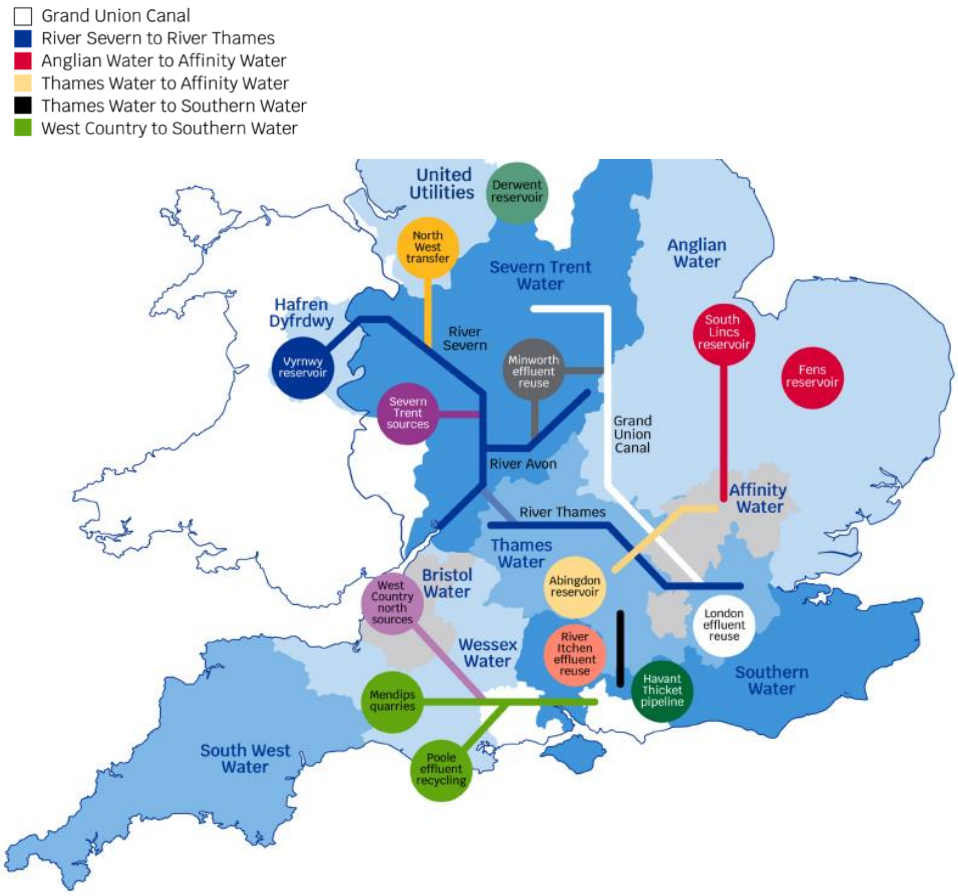


Figure 16: Map of strategic region water resources solutions supported by the RAPID gated process[11]

We collaborated regionally through the Water Resources in the South East (WRSE) alliance to develop a shared approach to adaptive planning and have delivered elements of the supply and demand forecasts through group projects, following shared methodologies.

WRSE is an alliance of the six water companies which cover the South East of England – Affinity Water, Portsmouth Water, SES Water, Southern Water, South East Water and Thames Water (see Figure 17).

[11] Source, RAPID, Forward programme 2022–23, March 2022, www.ofwat.gov.uk/wp-content/uploads/2022/04/RAPID-forward-prog-2022.pdf

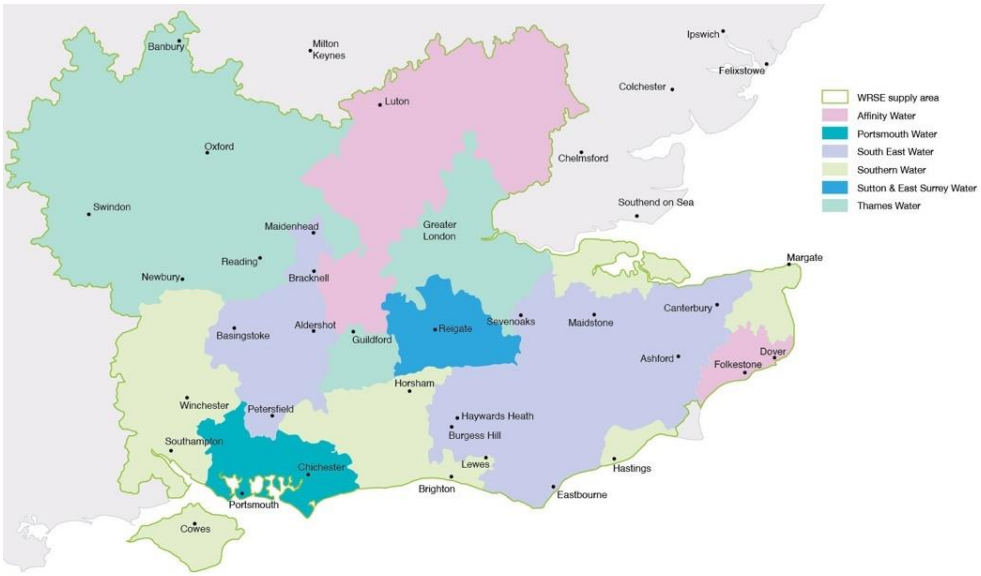


Figure 17: The supply areas of the six water companies that form the Water Resources South East (WRSE) alliance

Working as a regional alliance, WRSE commissioned the development of a regional investment model. Using agreed metrics, the model helps us to identify the options that provide water in the right place at the right time across the whole region, while addressing legal and regulatory requirements and policy expectations initially at the most efficient cost.

The next step was to carry out further assessments of our options and consider wider benefits beyond cost. This enabled us to identify whether we can deliver additional value through our plan that will further improve the region's environment, resilience, and benefit to wider society. This could mean some options are chosen as they deliver best value to the region, albeit at a higher cost.

By aligning with the WRSE regional plan, our WRMP24 aims to balance national, regional, and local interests – reflecting both the best value regional plan but also the service level and environmental ambitions of our regulators, customers, and stakeholders.

This document is the main statutory document for the WRMP24. It is accompanied by a non-technical summary and is also supported by water resources planning tables and detailed technical appendices.

1.2 Strategic Environmental assessment (SEA)

Due to the potential for the WRMP to lead to schemes which will require an Environmental Impact Assessment (EIA), it is a statutory requirement that a Strategic Environmental Assessment (SEA) is undertaken under the European Directive 2001/42/EC for "the assessment of certain plans and programmes on the environment" (the 'SEA Directive'). The SEA Directive came into force in the UK through the Environmental Assessment of Plans and Programmes Regulations 2004 (the "SEA Regulations"). While the United Kingdom has now left the EU, the SEA Regulations still apply to a wide range of plans and programmes, including water resource management plans, and modifications to them.

The SEA Regulations reflect the overarching objective of the SEA Directive, which is:

"To provide for a high level of protection of the environment and to contribute to the integration of environmental considerations into the preparation and adoption of plans… with a view to promoting sustainable development, by ensuring that, in accordance with this

Directive, an environmental assessment is carried out of certain plans… which are likely to have significant effects on the environment." (Article 1)

The main requirements introduced by the SEA Regulations are that:

- The findings of the SEA are published in an Environmental Report (ER), which sets out the significant effects of the WRMP;
- consultation is undertaken on the plan and the ER;
- the results of consultation are taken into account in decision-making relating to the adoption of the WRMP; and
- information on how the results of the SEA have been considered is made available to the public.

As such, it is a key element of the SEA to act iteratively with the development of the WRMP24 to ensure that environmental and certain economic and social considerations are incorporated into the assessment process at the earliest stages. This is important because whilst the WRMP includes interventions developed both within our supply area, and those shared with neighbouring water companies, there is a potential that some of these solutions may cause adverse effects on the environment or the people of the area, particularly during their construction, but also through operation.

As mentioned previously, we are also working through WRSE to produce a regional resilience plan for the whole of the South East Region. For the same reasons described above, the regional plan also requires an SEA to be undertaken. The SEA for our plan complements that done for the regional plan but allows for 'local' scrutiny of environmental issues and opportunities.

The issues considered in the two SEAs are those set out under the SEA Regulations, namely of biodiversity, soils, the water environment, air and climate, cultural heritage, and landscape, as well as people-based topics of health and material assets.

A bespoke assessment framework, compatible with that developed for WRSE as part of the regional SEA but specific to the Portsmouth Water area, was developed through a review of relevant plans and policies, as well as local baseline information. This ensured that relevant local issues would be addressed as part of the assessment process and would allow for mitigation to be developed to help reduce any adverse effects identified, or to allow for opportunities for environmental improvement to form part of the WRMP development.

The robustness of this local assessment framework was verified through consultation on the SEA Scoping Report with key stakeholders and regulators and comments received formed an important component of refining the assessment process. This consultation process, and how it impacted our approach is documented in Section 3.5 and the SEA that accompanies this WRMP24.

Since the dWRMP24, our SEA has been updated to reflect both the final WRMP24 preferred plan, regulatory feedback received and updates in plans and policies that have occurred since the draft plan submission. As set out in Section 1.9.1, this includes a revision to the Water Resources Planning Guidelines (WRPG) developed by the Environment Agency (EA). This revised guidance set out some changes to regulatory expectation, including additional assessment criteria for 'Significant Effect' which has been used to inform the assessments for the final WRMP24, including the SEA.

Further, more detailed, assessment has also been carried out in relation to a range of topics such as potential effects on heritage assets, as well as Sites of Special Scientific Interest (SSSI), with results of these assessments being used to further inform consideration of Options proposed under the final WRMP24. A further benefit of these assessments is that

the results can also be used to help inform future design of any scheme derived from the Plan.

In addition, we have considered a wide range of guidance documents and advice notes such as those produced by Historic England and Natural England, as well as other bodies such as the Forestry Commission and have considered the implications of these for the Options contained within the final WRMP24. These documents covered a wide range of topics such as the setting of heritage assets, protected species, the loss of peatland, conserving biodiversity, ancient woodland and so on.

Consideration of issues across the region, as well as at the local level is a new approach to water resource planning and identifying wider environmental effects. Whilst this approach has been challenging, it has meant that effects are not considered in 'isolation' i.e. through the lens of only one water company, but rather are considered in a more holistic manner, allowing the development of a robust evidence base which can be built upon in the coming years to allow a much more effective protection of the environment to be accomplished.

1.2.1 Other environmental assessments that helped inform the SEA

Alongside the SEA process (and helping to inform it), a series of specialist environmental assessments have been undertaken of water and biodiversity aspects that are relevant to water resource management planning. These include Natural Capital Assessment (NCA), Water Framework Directive (WFD) assessment, Biodiversity Net Gain (BNG) assessment and Invasive Non-Native Species (INNS) assessment.

The Water environment (Water Framework Directive) (England and Wales) Regulations 2017 require all natural water bodies in the UK to achieve both Good Chemical Status (GCS) and Good Ecological Status (GES) which, collectively, result in a water body classification of "good" status. River Basin Management Plans (RBMP), published by the Environment Agency, identify actions considered necessary to enable natural water bodies to achieve good status. Any new activities or schemes in a WRMP that might, without mitigation, negatively affect the water environment require careful consideration. Assessments have been made of Options within the WRMP, to determine their possible effects on waterbodies.

Biodiversity Net Gain (BNG) is an approach applied during the consenting of any new schemes or developments that requires them to leave the natural environment in a measurably better state than beforehand. Natural England have produced a biodiversity metric that provides a way of measuring and accounting for biodiversity losses and gains resulting from development or land management change.

Natural capital is defined in the 25 Year Environment Plan (England) as "the elements of nature that either directly or indirectly provide value to people". As a new and emerging approach, natural capital incorporates methodologies and approaches (such as ecosystem services) to understand the value that natural assets provide. For the water industry, these can be substantial. The Water Resource Planning Guideline (WRPG) (England and Wales) states that WRMPs should "use natural capital in decision-making", "use a proportionate natural capital approach", "deliver environmental net gain", and provide cost information on monetised ecosystem service costs and benefits where monetisation is used. WRSE have conducted these BNG and Natural Capital assessments in full, but the findings have been used to inform our WRMP24.

An Invasive Non-Native Species (INNS) assessment of our options has also been carried out to determine the threat of inadvertently spreading INNS. The results of these INNS assessments have formed part of the SEA process for the biodiversity and water objectives. INNS dispersal can occur through a range of recreational and operational (water company) 'pathways', which may include water or land-based recreation and sports, and water company operations, such as ground maintenance and the operation of Raw Water Transfers (RWTs).

Further to the above assessments, and to satisfy consultation comments from natural England and Historic England, we have also undertaken a SSSI Assessment and Heritage Impact Assessment (HIA) which have helped to inform the SEA. A SSSI is a conservation designation made to protect an area that is considered extremely valuable for its flora, fauna, physiological and geological features. Natural England identifies and protects SSSIs in England under the Wildlife and Countryside Act 1981 (as amended). Portsmouth Water understand that impacts on the condition of SSSIs could result from activities related to the construction of our required water supply infrastructure, or its operation. The SSSI assessment identifies which of our options (and their related construction / operation) could potentially pose a risk to a SSSI and identifies further work / processes required to be undertaken at later stages to mitigate the risks.

The potential for construction and operation of water resources infrastructure to result in adverse impacts on the historic environment, above, at, and below the surface is recognised in paragraph 4.8.1 of the National Policy Statement for Water Resources Infrastructure (2023) (NPSWRI)[12]. A HIA methodology, agreed with Historic England, was therefore used to complete an assessment on all pre 2035 options featuring in the WRMP24 as it was agreed that these options are supported by a reasonable level of certainty with regard to location and design information. The assessment considers impacts resulting from physical impacts on archaeological remains, impacts on the setting of heritage assets, opportunities for conserving and enhancement of heritage assets, and improvement in their access, understanding and enjoyment and the potential for hydro-morphological and groundwater changes to impact heritage assets.

1.3 Habitats Regulations Assessment

Within our supply area there are a series of areas that are of vital importance to nature conservation, such as ephemeral and perennial chalk streams. Therefore, in addition to SEA and the specific environmental assessments outlined above, another specialist assessment has been made of the WRMP.

This assessment, known as a Habitats Regulations Assessment (HRA), is required by Regulation 105 of the Conservation (Natural Habitats, and species) Regulations 2017 (as amended by The Conservation of Habitats and Species (Amendment) (EU Exit) Regulations 2019) and is required where a land use plan is likely to have a significant effect on such sites designated for nature conservation and is not directly connected with or necessary to the management of that site.

Such sites include Special Areas of Conservation (SAC) and Special Protection Areas (SPA). An HRA is also required, as a matter of UK Government policy, for other designations, including Potential SPAs (pSPA), Possible SACs (pSAC), listed and proposed wetlands of international importance (Ramsar sites and proposed Ramsar sites), sites identified as compensatory measures for adverse effects on habitats sites, pSPA, pSAC.

In short, an HRA determines whether there will be any 'likely significant effects' on designated sites because of the implementation of the WRMP (either on its own or 'in combination' with other plans or projects) and, if so, whether these effects present a risk of adverse effects on the site's integrity.

As set out in Section 1.9.1, the dWRMP24 and supporting Environmental assessments (SEA and HRA) were developed to comply with the WRPG (December 2021) developed by the EA. This revised EA guidance (April 2023) set out some changes to regulatory expectation, including additional assessment criteria for 'Significant Effect' which has been used to inform

[12]https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1150075/E02879931_National_Policy_Statement_for_Water_Resources.pdf

the assessments for the final WRMP24, including the SEA and HRA. Section 8.2.2 B 'Habitats Regulations (Conservation of Habitats and Species Regulations, 2017)' specifically notes the need to assess if there are any likely significant effects on designated sites from any of our options (such as a potential new abstraction or from increased abstraction at an existing source) before we consider them as feasible options. Where we cannot conclude 'no likely significant effects', an 'appropriate assessment' is required to establish if the option can be delivered without having an adverse effect on the integrity of a designated site. The Environment Agency note the need to do a HRA should not be a reason on its own to screen out an option. This is because a HRA screening may conclude that there are 'no likely significant effects'. Alternatively, an appropriate assessment may conclude 'no adverse effects on integrity.' Either of which may allow the option to be retained within the plan.

Designated areas protected under the Habitats Regulations are shown in Figure 18 below.

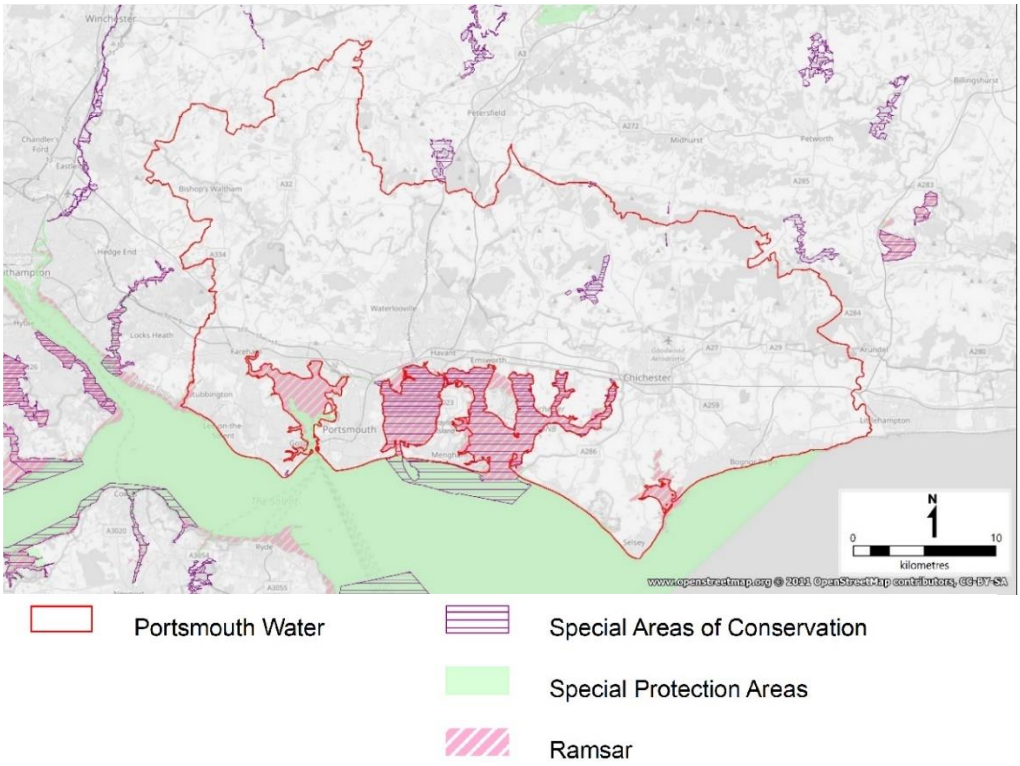


Figure 18: Map of the Special Areas of Conservation, Special Protection Areas and RAMSAR areas that have the potential to be impacted by this Plan

1.4 Consultation and engagement

Engagement with customers, regulators, stakeholders, employees and other Water Companies across the South East has been fundamental to the development of the WRMP24.

The public consultation on the dWRMP24 continued the collaboration already undertaken for its development. Regionally we have worked with customers, other WRSE member water companies, the water industry regulators, other regional water planning groups and a range of stakeholders to develop our WRMP24.

Pre-consultation on the regional and dWRMP24 plans included the following:

- At a regional level the WRSE Emerging plan consultation was launched in January 2022. Well attended consultation webinars were held, with several of our local stakeholders, such as “Friends of the Ems” actively participating.
- At a company level, we have been undertaking our own consultation and engagement activities. We have identified “future water supply” and “demand management” as two of the five ‘big conversation’ topics we are having with customers through the current WRMP and business planning round. We commissioned several research activities, as well as systematically capturing existing consumer data and insight from over 32 reports relating to these. The views and preferences of our customers have directly influenced the development of our Plan.
- In January 2022 we wrote to 169 individual representatives of regulators, Non-Governmental Organisations (NGOs), Councils and interested groups with details of our emerging dWRMP24, to ask for feedback and invite them to comment on our approaches.
- Dedicated pre-consultation discussions were held with Ofwat, the Environment Agency, the Consumer Council for Water (CCW), The Drinking Water Inspectorate (DWI), and Natural England.

Our dWRMP24 Strategic Environmental Assessment (SEA) Scoping Report was circulated to key stakeholders and regulators on 14 March 2022 for consultation. Comments were received from the Environment Agency, Natural England, and Historic England.

Our dWRMP24 Strategic Environmental Assessment (SEA) Environmental Report was circulated to statutory consultees alongside the public consultation of our dWRMP24.

Section 3 provides more information about how engagement has contributed to the development of this WRMP24.

Prior to implementing any WRMP24 options we will develop and implement a full engagement plan to stakeholders and customers impacted by schemes. We will also work with colleagues in neighbouring water companies, for example to produce a cohesive Protected Landscape Management Strategy, for those areas which are considered our most important landscapes. In addition, we will continue to work with regulatory bodies such as Environment Agency, Natural England and Historic England, as well as Local Authorities to help ensure environmental and social issues remain a key focus of the development of any Option contained within our Plan.

1.5 WRMP as part of a wider planning landscape

Water resources planning, and the WRMP24 specifically, does not operate in isolation. It has interdependencies with other plans and processes both within Portsmouth Water and more widely with regional and national plans and ambitions.

Within Portsmouth Water, we have ensured alignment across each of the different planning processes through a WRMP24 steering group which has met each month during the development of this plan.

In the table below (Table 4) we summarise how we have ensured this WRMP has taken specific elements of the wider planning landscape into consideration.

Table 4: How the WRMP links to the wider planning landscape

Aspect of Planning	Consideration.
The previous WRMP (Revised WRMP19 tables submitted December 2022)	WRMP19 data was used as starting place for WRMP24 (WRSE) modelling. Where there has been no change, WRMP19 work has been referenced rather than being repeated, for example for WRZ Integrity where we continue to operate as a single zone supply area. Conversely, where we have revised the WRMP19 in response to regulatory queries and challenges, we have incorporated new WRMP24 methodologies and approaches to include the latest analytical techniques. This effectively provided a bridge between WRMP19 and WRMP24. We've achieved a lot since our last water resources plan was published in 2019, including progressing our plans to build Havant Thicket Reservoir. However, the restrictions of the Covid-19 pandemic slowed our metering programme and other schemes could not progress as planned. At present we have less of a buffer in our supply demand balance (referred to as 'headroom') compared with that planned for in our original WRMP19. **This means there's currently a slightly higher risk we'd need to introduce emergency restrictions in a very severe drought, so we're resolving this in this final WRMP24, including the development of a monitoring plan.** In December 2022 we published our Revised WRMP19 (Dec 2022) which represents our latest WRMP19 (superseding Final WRMP19).
The PR24 business planning process	The water resources planning process runs in parallel to the periodic review business planning process, run by Ofwat. The Business Plan and WRMP are inherently linked, with WRMP investment requirements being put forward as part of the company's overall Business Plan. Alignment has been achieved through shared governance within the company. Our 25-year vision statement "*Excellence in Water. Always*." Sets out our company vision, against the backdrop of climate change and population growth, to provide an affordable, reliable, and sustainable supply of high-quality water for our customers. By being smart in our approach we will work with our local communities to meet our goals while protecting and enhancing the environment for future generations. Our number one priority within our 25-year vision statement is to, 'secure sustainable water supplies for our customers, which protect and enhance our environment in a changing world'. Some of the proposals we are testing with customers include the following: • Provide enhanced regional drought resilience by bringing Havant Thicket reservoir into service on schedule by 2029. • Reduce leakage by 50 per cent by 2040, 10 years ahead of the government's expectation. • Support customers to reduce personal water usage by 25 per cent. • Deliver universal domestic smart metering by 2035. • No customers will experience restrictions on their water use, even in a severe drought. • Enhance biodiversity on all the sites we own.

	Our second business priority is to, 'be at the frontier of delivering high-quality, resilient, net zero services – for our customers, environment and region'. The third is to, 'co-create solutions which deliver our customers', communities', and stakeholders' priorities', and fourth is, 'affordable water for all. Always'. In some cases, our ambition in the vision statement was greater than that incorporated in the dWRMP24 – specifically when it came to reducing leakage from our network. This reflected our desire to challenge ourselves and the ambitions of our customers. This disparity was resolved in our rdWRMP24 when our WRMP leakage plans were changed to reflect the customer support received during our public consultation for increasingly ambitious leakage targets.
The Drinking Water Safety Plan	Working with both the Water UK Water Quality Group, and through WRSE, we have developed a screening process for Drinking Water Safety Plan (DWSP) risks identified as part of the source to tap assessment. This is documented in Appendix 1B. This work has also been shared with our neighbouring companies where relevant, to ensure a consistent approach is taken for schemes that are common to both companies. More information is found in section 7.5.
The Drought Plan	We published our drought plan on 29 April 2022. This is an operational plan that sets out the actions we will take during drought periods (including the lead up to droughts) to ensure continuity of supply whilst at the same time continuing to protect the environment. The drought plan is linked to the WRMP, as the modelling of droughts of different severities and the groundwater levels that trigger timely actions are reflected in the WRMP process. Drought options, such as temporary use bans, drought permits and orders, also form part of the feasible set of options that are available to meet future deficits, alongside demand management and development of new supplies or transfers. There have been no changes to our previously agreed Levels of Service (LoS) or supply side drought permit options. We have on-going programmes of work that were agreed with the Environment Agency and Natural England as part our permission to publish our drought plan. We continue to liaise with Southern Water about their drought triggers on the Itchen. Southern Water submitted a technical note on drought triggers to the Environment Agency in Summer 2022. This included a joint position statement with us, which forms an addendum to our drought plan. We also have new environmental assessment work from WRMP24, which will be used to update our drought plan appendices now it has been finalised.
WINEP	The Environment Agency, Natural England and Ofwat use the Water Industry National Environment Programme (WINEP) process to define the scope of environmental activities. Previously the WINEP focused on a 5-year funding programme but has increasingly moved to a long-term view and approach. The WINEP and WRMP24 both feed into the PR24 business plan process by proposing investment programmes for investigations and schemes to be delivered over the course of the next 5-year funding period and the longer term 25-year Defra Environment Planning period.

	The WRMP24 has strongly influenced the development of the WINEP programme due to the requirement to investigate a significant number of abstraction sources to confirm the need and scale for sustainability reductions to meet our 'Environmental Destination' (including 'Licence Capping'). Further information is provided within Section 5.4 and Appendix 5B 'Investigating and Achieving Sustainable Abstraction'. WRSE have scored all the catchments we operate in as high priority for meeting the proposed environmental destination and therefore significant sustainability reductions are modelled within the baseline supply demand balance. As a result, a range of supply and demand schemes are needed to meet a supply demand balance deficit. These potential sustainability reductions will be refined via detailed investigations and options appraisals in the WINEP. The influence of the WINEP on future WRMPs includes: • No-deterioration studies to review the effects of increasing abstraction beyond recent actual. • Abstraction licence capping where certain abstraction sources are capped at recent actual rates if this is considered appropriate as part of a best value environmental solution. • Catchment management to manage raw water quality and to meet Drinking Water Safety Plan (DWSP) obligations.
The Plan for delivering Net Zero	We currently generate 10 per cent of our energy from solar panels and are trialling electric and zero emissions vehicles. It is our vision that we will be totally net zero by 2050 – both in our operations and our embedded carbon. We'll generate more energy than we need from our operations and assets, and export this to our local communities. All our vehicles will be zero emissions – embracing the latest technology. Since the dWRMP24 we have produced a new Carbon Appendix (7E) which details the baseline carbon, our approach to net zero and the carbon resulting from the preferred plan.
The existing development of the Havant Thicket Reservoir	We're working in partnership with Southern Water to deliver Havant Thicket Reservoir. This scheme was approved as part of our WRMP19 and PR19 Business Plan. Havant Borough Council's Planning Committee resolved to grant planning permission for both the reservoir and the pipeline between it and Source B2 on 3 June 2021. The reservoir will secure more reliable water supplies for the South East region and protect the environment. By using the reservoir to supply our own customers, we can share supplies from our other water sources with Southern Water. This will mean that Southern Water can reduce the amount of water that they take from the chalk rivers Test and Itchen in Hampshire. These rare and sensitive chalk streams are home to many species. It will also help us to address growth in the population and housing and increasingly severe droughts that are predicted due to climate change. The completed reservoir is intended to be full of water and open to the public in the winter of 2031-32. Please note that the current approved plan for the reservoir, included in the baseline of this WRMP24, has no associated element of recycled water.

	Together with Southern Water, we are exploring options for the future, which include adding recycled water to the reservoir and taking a pipeline from the reservoir directly to Southern Water's supply area. But these options are in a relatively early feasibility stage. More information about these options can be found in Section 7.8.

1.5.1 Regional planning

Regionally, this is our most collaborative water resources planning process yet. We share common methods and approaches across the South East, have undertaken regional engagement with regulators and stakeholders and use a single regional investment planning model to inform our WRMP24.

The WRSE draft regional plan sets out how we, as a region, plan to achieve a secure, resilient, and sustainable supply of water for our customers and other sectors, across a challenging range of potential futures for the next 50 years. This will ensure that water is used in the most sustainable way in the years to come. The plan will ensure we improve the environment, and that we will be able to adapt to climate change, whilst providing the water needed as the population grows. It will deliver a step-change in how we use water so that we reduce the demand for water and use what we need as efficiently as possible. It will make the region's water supplies more resilient to drought and other shocks – providing 21st century solutions so that society always has the water it needs.

We have looked to local authority development plans to inform the regional demand forecast. We have also invited third parties to suggest possible options and we have considered non-public water supplies for the first time.

We are fully committed to the WRSE approach. As such, where appropriate we are referencing WRSE method statements and other published documents within this WRMP24.

Our preferred best value plan (in Section 10) has been informed by the draft regional plan, with modifications for local considerations where necessary.

WRSE consulted on the draft regional plan at the same time as we consulted on our dWRMP24, and as the other five water companies across the region consulted on their dWRMP24s. These were separate consultations.

This statutory WRMP24 document is accompanied by a statement of response.

Figure 19 shows the high-level alignment and key interactions in the timetables of the WRSE regional plan with our own WRMP24.

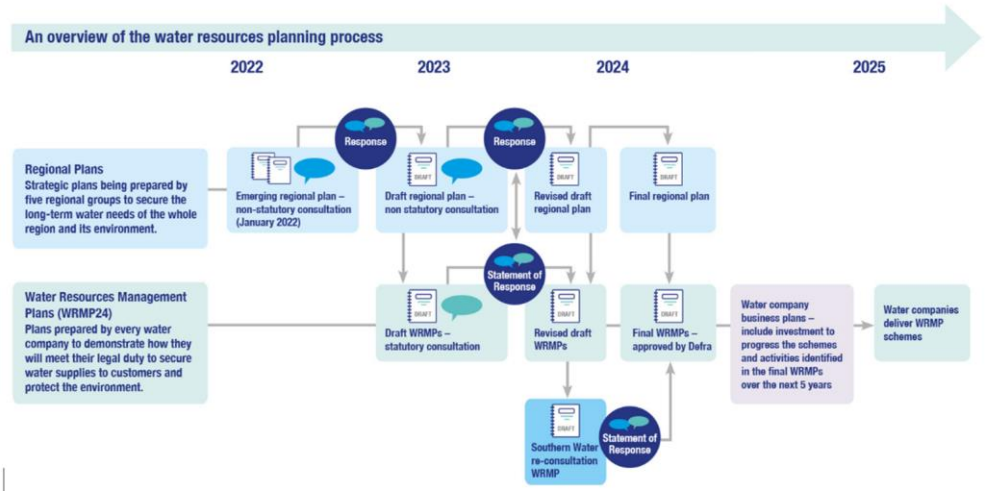


Figure 19: Alignment of regional plan and WRMPs

1.5.2 River basin catchment planning

We have looked to engage with and align with the objectives of River Basin Management Plans (RBMPs) and planning catchment groups to meet WFD obligations. We have achieved this through engagement with individual catchment partnerships.

We work collaboratively to develop catchment and nature-based strategies and work delivery plans. For example, we are part of the Arun and Western Streams Catchment partnership on the River Ems to create and develop the River Ems Chalk Restoration Scheme. After completing baseline environmental assessments, a series of stakeholder task and finish groups will co-create a sustainable river restoration plan to be delivered over the next 25 years.

Our work will continue in AMP8 through both the WINEP investigation programme and our options generation and appraisal work.

1.5.3 National plans

More widely we have considered the National Framework for Water Resources as well as other national planning frameworks, such as:

- PR24 and beyond: Long-term delivery strategies and common reference scenarios, Ofwat, November 2021
- A Green Future: Our 25 Year Plan to Improve the Environment, DEFRA, 2018
- National Infrastructure Strategy, HM Treasury, November 2020
- Environment Agency's 2027 Abstraction Plan – ref Section 5.4
- The draft Environment Bill, and Local Nature Recovery Strategies.
- National Infrastructure Commission's resilience document – Anticipate, React, Recover published in May 2020
- The Government's Environmental Improvement Plan, 2023

Table 5 shows where the influences and interconnections are in this plan with other Portsmouth Water, regional and national plans. These links have been made in technical work and stakeholder engagement.

Key:

- ● Ongoing interdependency
- ◊ New regional or national driven interdependency
- ○ New Portsmouth Water driven interdependency
- ♦ New Portsmouth Water and Regional/National interdependency

		Portsmouth Water Plans						WRMP24 Chapter								
		WRMP24	Revised WRMP19	2021 Drought Plan and future 2026 Drought Plan	Drinking Water Safety Plan	Portsmouth Water's Net Zero Plan	PR24	2. Adaptive Planning	3. Engagement and Consultation	4. Demand Forecast	5. Supply Forecast	6. Supply Demand Balance	7. Options	8. Developing the Plan	9. Scenario Sensitivity Testing	10. Best Value Plan
Portsmouth Water Plans	Revised WRMP19	●		●	●		●		●	●	●	●	●	●	●	●
	2021 Drought Plan and future 2026 Drought Plan	●	●				●		●	●	●	●	●			
	Drinking Water Safety Plan	●	●				●						●			
	Portsmouth Water's Net Zero Plan	○					○						○	○		○
	PR24	●	●	●	●	○							●	●	●	●
Regional Plans	WRSE Regional Plan (including RAPID SROs and National Reconciliation with other regional plans)	♦	◊	◊	◊	♦	◊	♦	♦	♦	♦	♦	♦	♦	♦	♦
	Natural England Nature Recovery List	●					●				●		●			
	River basin Management Plan and Planning catchment groups (WFD obligation)	●	●				●				●		●			
	Local authority housing growth plans	●	●	●			●	♦		●		●				
	Abstraction Licence capping	◊	◊	◊			◊	♦			●	●	●			
	Environmental Destination	♦		◊			♦	♦		◊	◊	◊	◊			
National Plans	National Framework for Water Resources	♦	◊				◊	♦	◊	◊	◊	◊	◊	◊	◊	◊
	Government's 25- year Environment Plan	♦					◊	♦			◊	◊	◊			◊
	Ofwat's common reference scenarios	♦					◊	♦		♦	♦	♦			♦	
	Water Industry Natural Environment Plan	●	●				●				●		●			

Table 5: Ongoing and new interdependencies between Portsmouth Water Plans, Regional Plans, and National Plans.

1.6 Portsmouth Water operating area

At Portsmouth Water we are proud of our long tradition of serving Portsmouth and the surrounding area with high quality drinking water since the Company was established in 1857. Through amalgamation, the Company's supply area has expanded beyond Portsmouth to supply the towns and cities of Gosport, Fareham, Havant, Chichester, and Bognor Regis, in the counties of Hampshire and West Sussex (Figure 20).

On average, we distribute around 175 million litres of water each day to over 740,000 customers in around 320,000 properties. Some customers on new housing estates are also supplied by New Appointments and Variation companies (NAVs).

Figure 20: Portsmouth Water's supply area

We are a community-focused water company, with a strong history in supporting and maintaining good relationships with our customers. We also have a changing role in the South East region. We support our neighbouring water company, Southern Water, with bulk supplies of treated water so that, in part, they can reduce their abstractions on world renowned chalk rivers. Additionally, we are developing Havant Thicket winter storage reservoir in collaboration with Southern Water, which is due for completion 2031-32, to enable a further bulk supply into their Hampshire zone.

The area of supply includes a large expanse of coastline with numerous important habitats that have been designated under European Directives (including the South Downs National Park). As a statutory undertaker, we have due regard to the purposes of the national park.

1.6.1 A single Water Resources Zone supply area

Our supply area is made up of a single Water Resource Zone (WRZ). These zones are a key building block for water company WRMPs. They are defined as:

> *The largest possible zone in which all resources, including external transfers, can be shared and hence the zone in which all customers will experience the same risk of supply failure from a resource shortfall.*

Our distribution system includes significant strategic treated water storage spread across a series of large, treated water storage reservoirs and is based around a spine main that runs East to West across our Region. This system ensures that all our customers in the supply area experience the same level of service and the same overall risk of supply failure. This applies under normal, dry year and drought conditions.

There have been no changes to the company area or WRZ configurations since WRMP19. As there have been no significant zonal configurations to the water supply network, the results of the WRMP19 Water Resource Zone Integrity Study are still relevant and have continued to be used to inform this finding. This report is set out in Appendix 1A.

We anticipate a revised Water Resource Zone Integrity Study for WRMP29. This will be informed by python-based water resource modelling we have carried out for WRMP24, which has provided greater insight into how our sources operate conjunctively, as a system.

1.6.2 Sources of water

We have 21 water sources, abstracting an average of around 175 megalitres per day (Ml/d) from one group of springs, one river and 19 borehole sites. Our system currently has no significant raw water storage, so we are reliant on the recharge of groundwater over the winter period.

The triangles in the map below (Figure 21) provide an overview of where our water comes from across our supply area. These are known as abstraction sources and the amount of water we take. The timing of when we take it is governed by the Environment Agency through their Abstraction Licencing system.

Most of our sources are subject to 'group licences' where the abstraction licence conditions span more than one specified site. Just six of our abstraction sites have individual licences.

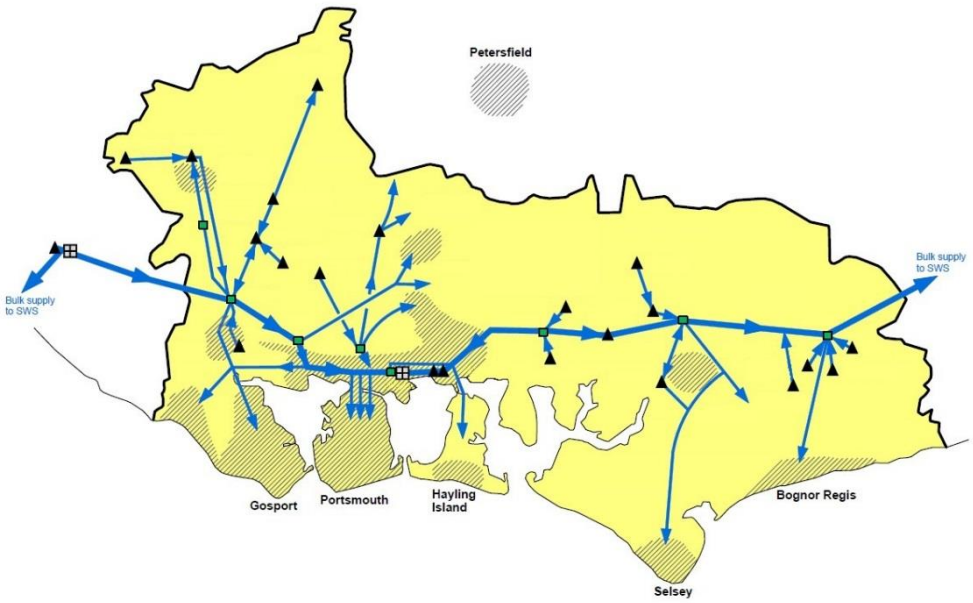


Figure 21: Map of Portsmouth Water Area of Supply

1.6.3 Sharing water with Southern Water

We currently supply two bulk transfers of water to our neighbour Southern Water. One flows East into their Sussex Zone, with a capacity of 15 Ml/d which is available on a 'best endeavours' basis, with a sweetening flow of 1 Ml/d required at all times. The second sends

water West into their Hampshire Zone. It is also up to 15 Ml/d with water volumes guaranteed through a reservation basis.

In addition to these existing bulk supplies, we are also planning to provide Southern Water with an additional future bulk supply to support their Hampshire zone as they continue to reduce abstraction from chalk rivers. The development of Havant Thicket Reservoir will enable us to increase our bulk supplies to Southern Water by up to a further 21 Ml/d in 2031/32.

We have worked closely with Southern Water in the development of this plan to ensure our WRMP24s are aligned. Since the draft plan we have produced a new joint appendix which details our shared understanding and agreement of how we will operate the transfer. It was updated for our final WRMP24 to align with Southern Water's September 2024 re-consultation on its WRMP24. Please refer to Appendix 1C for further information.

As well as sharing water resources, Southern Water are the sewerage provider to our customers.

1.6.4 Havant Thicket winter storage reservoir

Havant Thicket Winter Storage Reservoir is a significant construction project being developed in collaboration between us and Southern Water. It will provide resilient water supplies to the region, supporting reduced abstraction on chalk rivers. The project has an overall biodiversity net gain and will offer a new community leisure facility for the area.

Havant Thicket Reservoir was approved in WRMP19 and has been included within the baseline of this WRMP24.

Figure 22: Artist's impression Havant Thicket Reservoir when completed and filled in 2031-32

1.7 Challenges and opportunities

1.7.1 Introduction

There are emerging challenges and opportunities for both future water supplies and customer demand. Our planning approach has been developed in response to the scale and nature of the challenges we face through the problem characterisation framework shown in Section 1.7.10. A summary of challenges and opportunities is provided in the sections below.

1.7.2 We operate in an area of serious water stress

In July 2021, Environment Agency (EA) reassessed which water companies are under serious water stress. This is defined as being where:

> *'the current household demand for water is a high proportion of the current effective rainfall which is available to meet that demand. Or, the future*

household demand for water is likely to be a high proportion of the effective rainfall which is likely to be available to meet that demand'.

In our last plan, WRMP19, our area was classified as being an area of 'moderate' water stress, but the EA's reassessment has reclassified our area to being in 'serious' water stress.

This classification allows us to target water efficiency measures in those areas of greatest need and to achieve the greatest potential benefit through universal, compulsory, metering of household customers if it is shown to be beneficial.

1.7.3 The challenge to reduce our reliance on chalk aquifers

To ensure the water we take from the environment is sustainable, we have worked with the Environment Agency to define our proposed environmental destination for planning purposes. In some cases, this means needing to reduce our use of existing water sources.

The likely impacts of capping or reducing our existing supplies to deliver environmental benefits is explored in Section 5.4. The scale and timing of the implementation of our proposed environmental destination (including abstraction licence capping) is a significant driver of new options and investment being required within our WRMP24.

1.7.4 An opportunity to contribute to a protected and enhanced environment

As well as an opportunity to increase our resilience and improve the sustainability of our existing supplies and biodiversity within our operating area, we are actively looking at ways to protect and enhance our environment. We are doing this through the WINEP as part of our business planning processes. However, we have also evaluated the environmental impacts of the options we have considered in this WRMP24, working through the SEA process when developing our preferred best value plan, and considered how to contribute to achieving Net Zero, Natural Capital and Biodiversity Net Gain.

1.7.5 Uncertainty around population increase and the 'new normal' for water use

For demand forecasting, there is uncertainty around how long the changes in demand that started during the Covid-19 pandemic will continue, and although our customer population is forecast to grow, there is additional uncertainty around the potential impact of Brexit and global politics on population forecasts.

The impacts of the pandemic on water use were a significant uncertainty for our dWRMP24, especially as the demand forecast was based on pre-pandemic data when household water use was lower because less people worked from home as they do now. For our final WRMP24 we have more information to use as an indication of the 'new normal'. Our household baseline demand forecast has increased and the uncertainty around the impacts of the pandemic have reduced, although there is still uncertainty over longer term changes to water demand.

The potential variation in our baseline demand forecast is significant. When including the latest forecasts produced by the Office of National Statistics (ONS) and local authority housing plans, our customer population could grow by between 8.7 per cent and 30.4 per cent over the next 50 years, compared with our baseline year of 2021-22. This is a wide range and is illustrated in Section 4.3.1.

1.7.6 A changing climate and our planning scenarios

Climate change is leading to hotter drier summers, milder wetter winters and more frequent extreme weather events. As the climate continues to change this could mean increasing demand for water or reduced ability to supply water from our existing sources.

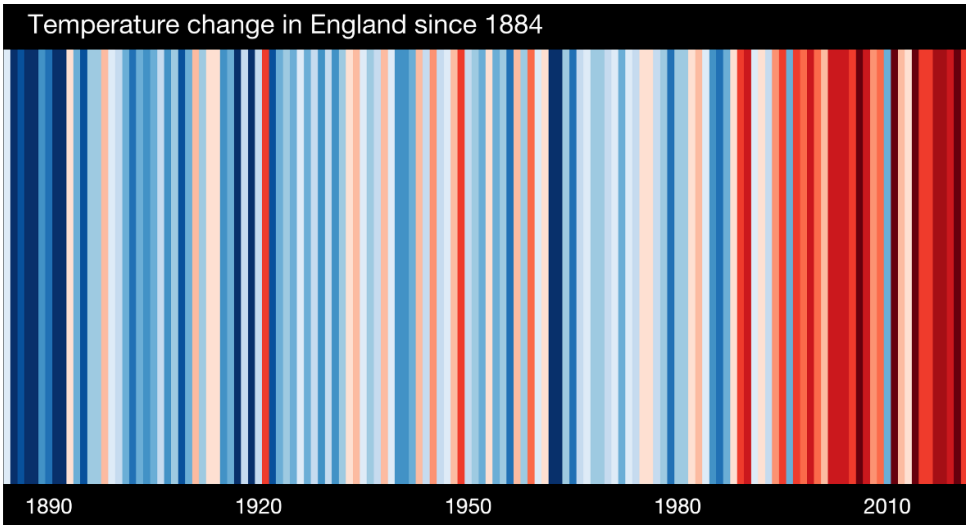


Figure 23: Average temperature for each year in England since 1884, shown using Reading University's 'Show Your Stripes[13]'. Each stripe represents the average temperature for a single year, relative to the average temperature over the period. Shades of blue indicate cooler-than-average years, while red shows years that were hotter than average. The stark band of deep red stripes on the right-hand side of the graphic show the rapid heating of our planet in recent decades.

Summer 2022 was a poignant reminder of this challenge with record temperatures across the UK, which led to soaring demand for water and presented a significant challenge to supply the necessary water to meet this demand.

Appendix 1H to this WRMP24 sets out the details of how we managed the dry summer of 2022 in accordance with our drought plan, the lessons we learned, and how we incorporated this learning into our WRMP24.

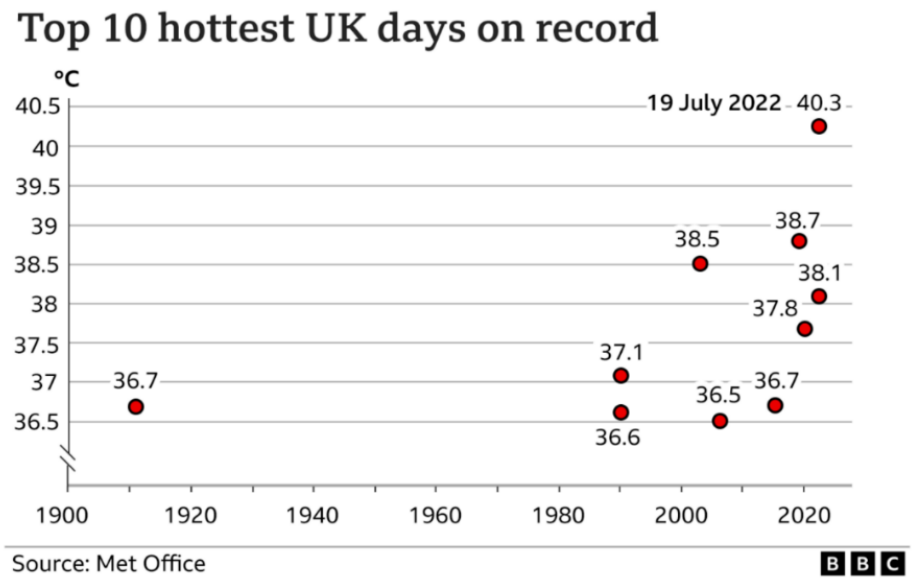


Figure 24: A graph showing nine of the ten hottest UK days on record have happened since 1990[14]

[13] https://showyourstripes.info/l/europe/unitedkingdom/england/

[14] Source Met office, via BBC downloaded July 2022, https://www.bbc.co.uk/news/world-europe-62224157

Although both Figure 23 and Figure 24 above show climate change, there is an important distinction between them. Whilst Reading University's climate stripes show the average temperature across a single year, the other graph shows single hottest days.

We need to plan to ensure reliable water supplies both over the whole of a dry year, as well as being prepared for shorter critical periods that can put strain on our systems. These critical periods can be in the form of summer heatwaves when demand for water is high and available water is low, or freeze-thaw events when frozen ground leads to broken underground pipes and a sudden increase in leakage. Our supply network proved resilient to the 2018 freeze-thaw event and the 2018 and 2022 summer heatwaves.

In this WRMP24, we plan for an average normal year (NYAA), a dry year (DYAA), and a critical period (e.g. summer peak demands) in a dry year (DYCP). We recognise that the climate is changing within these planning scenarios. With the expectation of more frequent warmer drier summers and warmer wetter winters, we need to prepare for conditions more challenging and more extreme than those previously experienced.

The modelling in this plan provides the strategic basis for investment needed. It is supported by our drought plan which is an operational plan of actions we would take as dry conditions worsen.

1.7.7 The opportunity to increase our resilience

Our WRMP19 supply forecast was based on a design drought of 1-in-200 years. In deciding on this design drought, the company followed the 'UKWIR Risk based planning guidance' (UKWIR, 2016b) and opted to develop a resilience tested plan (risk composition 2) that considered a challenging, but plausible range of droughts.

We moved to this 1-in-200 year level of resilience for WRMP19 from a position in WRMP14 where we planned to the worst historic drought on record. This move was enabled by the development of synthetic rainfall and climate data and driven by the recognition that our future is likely to see more extreme events than we have historically recorded. For WRMP19, this aligned with our commitment to providing a bulk supply to Southern Water with water available up to a 1-in-200 year event.

For this WRMP24 we are planning to deliver the government expectation of increased resilience to a 1-in-500 year drought event by 2039. As part of the development of the WRMP24 WRSE undertook analysis to determine the optimal timing to switch to a 1-in-500 level of resilience, which was 2039. However, moving to a 1-in-500 level of resilience reduces our deployable output which results in the need for additional sources of water.

As per our 2022 Drought Plan, we intend to use drought actions such as demand-side Temporary Use Bans (TUBS) and Non-Essential Use Bans (NEUBs), starting from 2025–26 within WRMP24.

In our plan, supply-side drought permits are not available for selection beyond 2040–41. This aims to decrease our reliance on options that could impact the environment when it is already stressed by drought.

1.7.8 Adaptive planning provides an opportunity to develop a plan able to accommodate uncertainty

The challenge of planning for an uncertain future is not a new one, but the range of uncertainty has grown, particularly with respect to changing climate, population and housing forecasts and reductions in existing abstractions to meet environmental destination delivery.

To meet this challenge, in collaboration with WRSE we have developed an adaptive planning approach to ensure we are prepared for a wide variety of future scenarios.

Our intention is that by applying an adaptive approach to our modelling, we ensure the decisions we take today are effective in ensuring a reliable source of water and a sustainable future, regardless of how the future unfolds.

1.7.9 What our customers told us they think our biggest challenge will be over the next 25 years

In June 2022 we surveyed 574 of our bill-paying customers. This was the second wave of our 'Consumer Panel Barometer' which is described in more detail in Section 3. A summary of our customer research is provided in Appendix 3C.

The first question we asked was, "What do you think the biggest challenge will be for Portsmouth Water over the next 25 years?" The answers showed that our customers are aware of a variety of possible future challenges for Portsmouth Water. Customers mention challenges relating both to the supply of and demand for water and consider both population and environmental factors. Many refer to properties/developments being built in their region.

When prompted, 9 in 10 expect population growth will mean higher demand for water. The majority also firmly believe climate change will have an impact on local environments. Meanwhile panellists are much less convinced that in future people will adjust their behaviours to reduce water usage – underlining the challenge faced.

Figure 25: Word cluster showing the frequently used words customers used when describing our future challenges

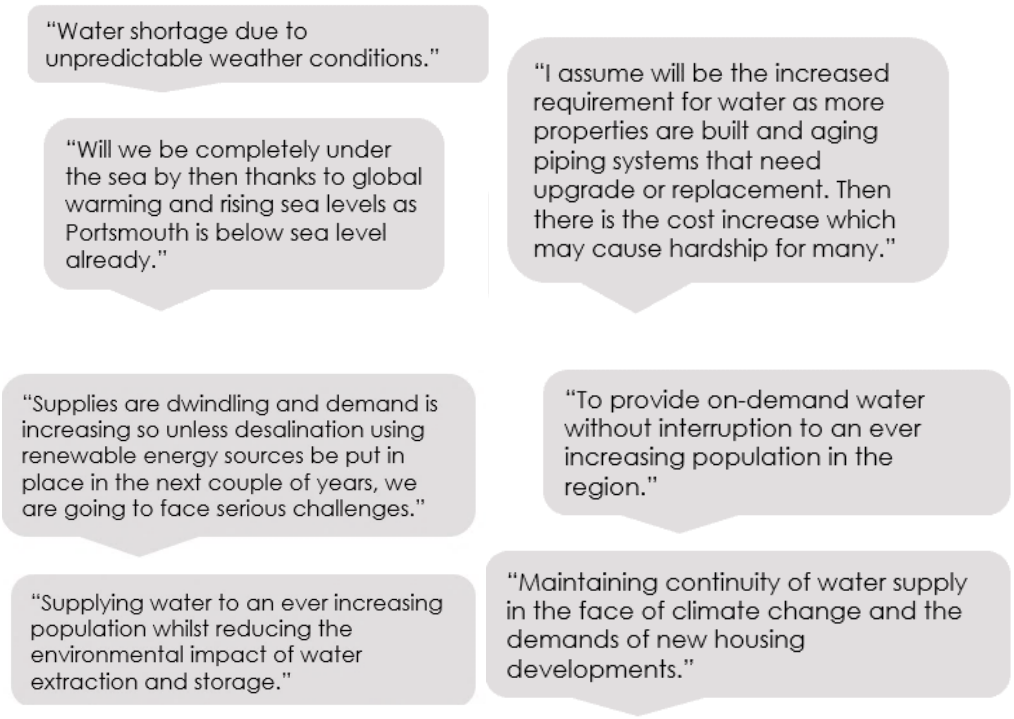


Figure 26: Quotes from customers describing challenges we face

The second question asked was, "To what extent, if at all, do you expect each of the following will happen over the next 25 years?"

Over eighty-five per cent of the people asked said that they expected population growth to lead to higher demand for water, and that climate change will affect local river habitats and wildlife.

Of concern is that over eighty per cent of respondents thought it probable or definite that long-term increases in living costs will mean that more people struggle to afford their water bill. With the cost-of-living crisis and threat of recession, affordability is increasingly a challenge.

Another challenge to address is that only thirty-seven per cent of respondents thought households in the regions would probably or definitely change their habits to use less water.

1.7.10 Problem characterisation

Problem Characterisation assessment is "a tool for assessing a company's vulnerability to various strategic issues, risks, and uncertainties".[15]

By assessing the scale of water resources challenge a company faces and the complexity of the options available to solve the challenge, a risk-based recommendation is made around the most appropriate risk-based and decision-making methods to support development of the WRMP24).

The result of the WRMP24 problem characterisation assessment, documented in Appendix 1E, is that the Portsmouth Water supply area has a high level of concern (Figure 27). This

[15] UKWIR, 2016 'WRMP 2019 Methods – Decision Making Process: Guidance, p40

indicates that several of the extended methods and even use of the 'complex approaches' may be appropriate for developing the WRMP24.

This conclusion informs and aligns with those of the WRSE regional Problem Characterisation assessment. The 'high level of concern' status is reflected in the complex approaches and methods adopted in development of the regional plan which is, in turn, informing our WRMP24. The approaches adopted for forecasting our supply capability and selecting an appropriate decision-making approach can be seen in Section 5.2.4.1 and Section 8.2 respectively.

		Strategic Needs Score ("How big is the problem?")			
		0–1	**2 to 3**	**4 to 5**	**6**
		(None)	**(Small)**	**(Medium)**	**(Large)**
Complexity Factors Score ("How difficult is it to solve?")	**Low (<7)**				
	Medium (7–11)				
	High (11+)			Portsmouth Water	

Key

Green	low level of concern means WRMP14 methods and EBSD decision-making is appropriate
Yellow	moderate level of concern means some 'extended' methods may be appropriate
Orange	High level of concern means several of the extended methods and even use of the 'complex approaches may be appropriate.

Figure 27: Matrix using the results of the problem characterisation assessment to identify 'modelling complexity' of the decision-making approach for WRMP24

1.7.11 Drought Vulnerability Assessment

The water resources planning guidance requires water companies to use the drought vulnerability framework, or an equivalent approach, to assess the resilience of their current supply system to a range of droughts of differing severity and duration.

For WRMP24 we have adopted the same approach to carrying out a drought vulnerability assessment as we did for WRMP19, but with updated data.

Similar to the previous WRMP19 drought vulnerability assessment, the modelling demonstrates that for a conservative Deployable Output run (simultaneous groundwater and surface water drought) there could be vulnerability to a 6 month drought event with 70-80% rainfall deficit on the October profile (return periods greater than around a 1 in 50 year event). Otherwise, our resource zone (with the drought plan in place) is currently resilient to droughts with a return period greater than the 1-in-200 year condition.

The level of resilience is similar to that presented in the previous WRMP19 drought vulnerability assessment, despite numerous changes to the data sets following WRMP24 updates.

Our Drought Vulnerability Assessment is included as Appendix 1F to this WRMP. It is important to note that this assessment only reflects the current situation and does not consider future changes to supply demand balance e.g. challenges caused by Environmental Destination, population growth and climate change.

1.8 Levels of service

When dry weather conditions persist, causing groundwater levels to pass predefined trigger levels, we will implement our drought plan. Continued dry weather would result in a steady escalation of restrictions on household and commercial users of water, designed to reduce their demand for water. These restrictions range from temporary use bans (TUBs) such as bans on the use of hosepipes, to non-essential use bans (NEUBs) that may start to impact businesses in the local area. These are also referred to as ordinary drought orders.

In more extreme circumstances, water companies may also ask for emergency drought orders to allow the use of standpipes and rota cuts to further reduce the demand for water. These actions are part of the emergency plan and not the drought plan or this WRMP.

We have agreed with our customers the frequency at which demand restrictions might need to be implemented. The agreed Levels of Service (LoS) are:

- Temporary Use Bans to be implemented no more frequently than in a 1-in-20 year drought event (a 5 per cent chance of happening in any given year).
- Non-Essential Use Bans to be implemented no more frequently than in a 1-in-80 year drought event (a 1.25 per cent chance of happening in any given year).
- Emergency Drought Orders to be implemented no more frequently than in a 1-in-200 year drought event (a 0.5 per cent chance of happening in any given year).

In advance of the implementation of TUBs, we would be engaging with our customers to make them aware of the implications of the dry weather episode on the water resource situation for the company and be asking them to reduce their water consumption voluntarily. In approaching customers, we would use the full range of media types to efficiently reach as many sections of our customer base as possible.

Given that we did not introduce any water restrictions on customer usage in 2021–22, we have upheld the performance commitment in our business plan.

Our levels of service are not planned to change in the future as part of this WRMP24 other than for emergency drought orders, which are proposed to change to 1-in-500 years in 2038–39 to meet the requirements of the Water Resources Planning Guideline (WRPG). However, for WRMP29 we may consult on changing our Temporary Use Bans level of service from 1-in-20 to a 1-in-10 in order to meet demand reduction targets. This would however require customer consultation.

Section 5.2.5 provides further information on the development of the levels of service.

1.9 Our approach to dWRMP24

1.9.1 Compliance

The dWRMP24 was developed to comply with the Water Resources Planning Guideline (December 2021) developed by the Environment Agency, Natural Resources Wales (NRW) and Ofwat, and Defra's Water Resource Management Plan (England) Direction 2022.

In January 2023 the Environment Agency issued a revised draft Water Resources Plan Guideline (WRPG) for WRMP24 and asked water companies to comment on the proposed changes. We submitted our comments through a shared WRSE regional response and in April 2023 the Environment Agency published a final updated version 12 of the WRPG.

The following bullet points provide a high-level summary of the changes to regulatory expectation and the implications of these for our WRMP.

- A more ambitious government expectation for a household per capita consumption (PCC) delivery target of 110 l/h/d by 2050 at a water company level under the dry year annual average (DYAA) planning condition.
- A challenge to bring forward environmental destination delivery.
- A challenge to deliver resilience to a 1-in-500 drought event before 2039/40.
- A 9% reduction in non-household water demand by 2037/38 from a baseline of 2019/20.
- Request for utilisation rates for options that are selected as part of our preferred plan.
- Additional environmental assessment criteria for 'Significant Effects'.
- Expectation for water companies to produce an appendix reflecting how it has considered its experiences of the unprecedented temperatures and associated peak demands from summer 2022.

As a result of this updated regulatory guideline, we made several changes to our rdWRMP24 including the addition of a new appendix providing information about the 2022 drought event and accelerating our ambitions to encourage the reduction of household demand for water across our supply area by aiming to achieve it in dry years as well as in normal years.

In producing our rdWRMP24 and final WRMP24 we have followed the relevant government policy expectations and specified outcomes. Table 6 sets out where in this WRMP24 each of these expectations is addressed.

Table 6: Location of the text in the WRMP 2024 where we have addressed the Water Resources Management Plan (England) Directions 2022

Planning period for water resources management plan		
Water Resource Management Plan (England) Direction 2022	**Location in Portsmouth Water's revised draft WRMP 2024**	**WRP Table**
2.(1) Other than Southern Water Services a water undertaker must prepare a water resources management plan for a period of at least 25 years commencing on 1 April 2025.	This relates to the whole document. The WRMP covers the period from 1 April 2025 to 31 March 2075.	WRP Tables template covers the period 2019–20 to 2074–75
Matters to be addressed in a water resource management plan		
Water Resource Management Plan (England) Direction 2022	**Location in Portsmouth Water's revised draft WRMP 2024**	**WRP Table**
3.(a) the appraisal methodologies which it used in choosing the measures which it has identified in accordance with section 37A(3)(b) and its reasons for choosing those measures	We have followed the approaches specified in the WRPG (December 2021). The WRMP has used outputs from various technical and consultation strands of the collaborative work undertaken for the WRSE regional plan.	Not referred to in WRP Tables
(b) for the first 25 years of the planning period, its estimate of the average annual risk, expressed as a percentage, that it may need to impose prohibitions or restrictions on its customers in relation to the use of water under each of the following— **(i) section 76(b);** **(ii) section 74(2)(b) of the Water Resources Act 1991(c); and** **(iii) section 75 of the Water Resources Act 1991, and how it expects the annual risk that it may need to impose prohibitions or restrictions on its customers under each of those provisions to change over the course of the planning period as a result of the measures which it has identified in accordance with section 37A(3)(b);**	Our planned levels of service have been agreed with our customers and are set out in section 1.8. The relationship between levels of service and deployable output is set out in section 5.2.4 and 5.2.5. It is not anticipated that there will be any change regarding the annual level of service risk over the course of the planning period other than for emergency drought orders (1-in-200 year to 1-in-500 year).	Table 2f: WC Level DYAA -Levels of Service - Final Planning

(c) the assumptions it has made to determine the estimates of risks under sub-paragraph (b), including but not limited to drought severity;	The annual risk of restrictions is set by the level of service agreed with customers. It has been assumed that the level of risk will not vary with time (other than for emergency drought orders). A full stochastic risk assessment of supply capability has been undertaken and is described in section 5.2. Section 9 describes how the plan has been tested.	Not referred to in WRP Tables
(d) in respect of greenhouse gas emissions – **(i) the emissions of greenhouse gases which are likely to arise as a result of each measure which it has identified in accordance with section 37A(3)(b), unless that information has been reported and published elsewhere and the water resources management plan states where that information is available;** **(ii) how those greenhouse gas emissions will contribute individually and collectively to its greenhouse gas emissions overall;** **(iii) any steps it intends to take to reduce those greenhouse gas emissions;** **(iv) how these steps will support delivery of any net zero greenhouse gas emissions made by it; and** **(v) how these steps will support delivery of the UK government's net zero greenhouse emissions targets and commitments**	We have evaluated carbon emissions for all feasible options in this WRMP. The methodology is described in section 7.4.1, with information presented in the options costing report (shared with the regulators) and in the SEA. The assessment of the likely emissions associated with the final planning scenario is set out in the SEA.	Table 4 WC Level Options: Appraisal Summary: Separate columns for: • Embodied carbon emissions (tCO_2 equivalent) • Operational carbon emissions under maximum utilisation scenario (tCO_2 equivalent per annum) • Average operational carbon emissions (tCO_2 equivalent per annum) • Total Carbon Cost (£M) Since the dWRMP24 we have produced a new Carbon appendix 7E which details baseline carbon, our plans for net zero and the carbon emissions resulting from the preferred plan.
(e) the assumptions it has made as part of the supply and demand forecasts contained in the water resources management plan in respect of—		

(i) the implications of climate change, including in relation to the impact on supply and demand of each measure which it has identified in accordance with section 37A(3)(b);	(i) We have assessed the impact of climate change on supply (section 5.5), demand (Section 4) and headroom (section 6.3). We have considered the impact of climate change on each of our options in section 7.4.1.	Table 3a: DYAA – Baseline Table 3b: DYAA – Final plan options Table 3c: DYAA – Final Plan Table 3d: DYCP – Baseline Table 3e: DYCP – Final Plan Options Table 3f: DYCP – Final Plan • Change in DO due to climate change • Percentage of consumption driven by climate change • Volume of consumption driven by climate change • Target headroom (climate change component)
(ii) household demand in its area, including in relation to population and housing numbers, except where it does not supply, and will continue not to supply, water to domestic premises; and	(ii) Our approach to estimating current and future household demand follows the methods in the WRPG and is presented in section 4. Population and housing numbers are derived from Local Authority estimates. We have used the plan-based forecasts without adjustment.	Table 3a: DYAA – Baseline Table 3b: DYAA – Final plan options Table 3c: DYAA – Final Plan Table 3d: DYCP – Baseline Table 3e: DYCP – Final Plan Options Table 3f: DYCP – Final Plan
iii) non-household demand in its area, except where it does not supply, and will continue not to supply, water to non-domestic premises or to an acquiring licensee;	(iii) Our approach to estimating current and future non-household demand follows the methods in the WRPG and is described in section 4.4.	Table 3a: DYAA – Baseline Table 3b: DYAA – Final plan options Table 3c: DYAA – Final Plan Table 3d: DYCP – Baseline Table 3e: DYCP – Final Plan Options Table 3f: DYCP – Final Plan
(f) its intended programme for the implementation of domestic metering and its estimate of the cost of that programme, including the costs of installation and operation of meters;	Section 4.3.2 sets out the assumptions we have made regarding metering in our baseline supply-demand balance (i.e. new properties and optant metering), whilst section 10.4.2 sets out our preferred final planning approach to additional	See lines below for details of where number of meters are recorded

(i) the proportion of smart meters to other meters; **(ii) if it does not intend to install smart meters, the reasons for this;** **(iii) its estimate of the cost of that programme, including the costs of installation and operation of meters;**	metering over the planning period (universal smart metering). The costs of the metering programme are presented in Appendix 10B and WRMP24 planning tables.	
(g) its estimate of the total number of meters installed to record water supplied to domestic premises at the commencement of the relevant planning period and include a breakdown of— **(i) the number of smart meters** **(ii) the number of meters that are not charged by reference to volume;** **(iii) the number of meters that are charged by reference to volume including-** **(aa)optant metering;** **(bb) change of occupancy metering;** **(cc) new build metering;** **(dd) compulsory metering; and** **(ee) selective metering,** **and its estimate of the impact on demand for water in its area of any increase in the number of premises subject to domestic metering;**		Base year numbers given in Table 2c: WC Level DYAA - Meter Installations (including meter upgrades) - Final Planning
h) its estimate of the total number of domestic premises which will become subject to domestic metering during the planning period and including a breakdown of— **(i) the number of domestic premises with smart meters;** **(ii) the number of meters that will not be charged by reference to volume;** **(iii) the number of meters that will be charged by reference to volume including-**	The number of premises which will become subject to domestic metering during the planning period as a result of the different types of metering in the baseline and the final plan are shown in sections 4.3.2, 7.2.5.1, and 10.4.2, and in the WRMP Tables. The expected volumetric savings to result from the final planning metering options are presented in the WRMP Tables.	Annual programme for changes in meter numbers from Base Yea given in Table 2c: WC Level DYAA - Meter Installations (including meter upgrades) - Final Planning

(aa)optant metering; **(bb) change of occupancy metering;** **(cc) new build metering;** **(dd) compulsory metering; and** **(ee) selective metering, and its estimate of the impact on demand for water in its area of any increase in the number of premises subject to domestic metering;**		
(j) its assessment of the cost-effectiveness of domestic metering as a mechanism for reducing demand for water by comparison with other measures which it might take to meet its obligations under Part III of the Act;	We have assessed the cost-effectiveness of metering options available to us (change of occupancy metering, void household metering and universal smart metering) against other options that could be used to balance supply and demand in the economic appraisal of options; see Section 7. Appendix 10B details our consideration of metering options for this WRMP24. Optant metering is already included in the baseline demand forecast, as is new property metering. Costs for these do not therefore form part of the WRMP cost-effectiveness assessment in accordance with the Water Resources Planning Guideline (Environment Agency and Natural Resources Wales, 2018).	
(k) its intended programme to manage and reduce leakage, including anticipated leakage levels and how those levels have been determined;	Our intended programme to manage and reduce leakage is set out in section 7.2.5.2. The updated leakage options for the WRMP24 preferred plan are reflected in the revised Section 10.4.1 and detailed in a new Appendix 10C.	Table 2a: WC Level Normal Year planning scenario Table 2d: WC Level DYAA - Key Components – Baseline Table 2e: WC Level DYAA - Key Components - Final planning

(l) if leakage levels are expected to increase at any time during the planning period, why any increase is expected;	Our leakage levels are not expected to rise during the planning period.	
(m) how its intended programme to manage and reduce leakage will contribute to – **(i) a reduction in leakage by 50 per cent from 2017/2018 levels by 2050; and** **(ii) any leakage reduction commitment it has made in respect of its appointment area;**	Our customers and stakeholders have consistently told us that reducing and managing leakage is a high priority for them. After careful consideration and engagement with our customers and communities through our draft WRMP24 consultation we have revised our leakage options to be more ambitious. We are committing to halving leakage levels by 2040. This is 10 years ahead of our dWRMP24 proposals. It is also 10 years ahead of the wider industry commitment to the National Infrastructure Committee targets set out in Water UK's Leakage Route Map and referenced in the Environment Agency's 2020 National Framework. The updated leakage options for the WRMP24 preferred plan are reflected in the revised Section 10.4.1 and detailed in a new Appendix 10C.	Table 2a: WC Level Normal Year planning scenario Table 2d: WC Level DYAA - Key Components – Baseline Table 2e: WC Level DYAA - Key Components - Final planning
(n) In respect of any relevant regional water resources plan – **(i) how this plan has been considered and reflected in its water resource management plan; or** **(ii) where the plan has not been considered and reflected in its water resources management plan, the reasons for this.**	This WRMP24 fully reflects the WRSE regional water resources plan, as discussed in Section 1.5.1	

1.9.2 Water resource planning process

In the broadest terms, the components of this WRMP24 can be grouped into three stages:

Defining the scale of the water resources challenge: we have assessed the balance between supply and demand during both average annual conditions, over a year, and for shorter-term critical period conditions such as during heat waves and high seasonal demand.

Determine what feasible options are available to help resolve this challenge: We generated a long list of as many potential options as possible. A screening process filtered out unsuitable and unviable options to ensure the options that have been put forward for modelling are feasible. The screening considered environmental, social, economic and practical aspects of each option, along with the practical benefit it could provide for water resources. We have taken a conscious twin track approach and actively generated and considered options that reduce demand as well as options which would increase our ability to supply.

Take steps to develop our preferred best value plan: Through modelling and optimisation we put forward the best combination and scheduling of options that ensure compliance with the WRPG. They deliver a reliable supply of water, at an affordable price using means acceptable to customers and stakeholders while protecting and, where possible, enhancing our environment.

Each of these three stages of planning are shown below in Figure 28.

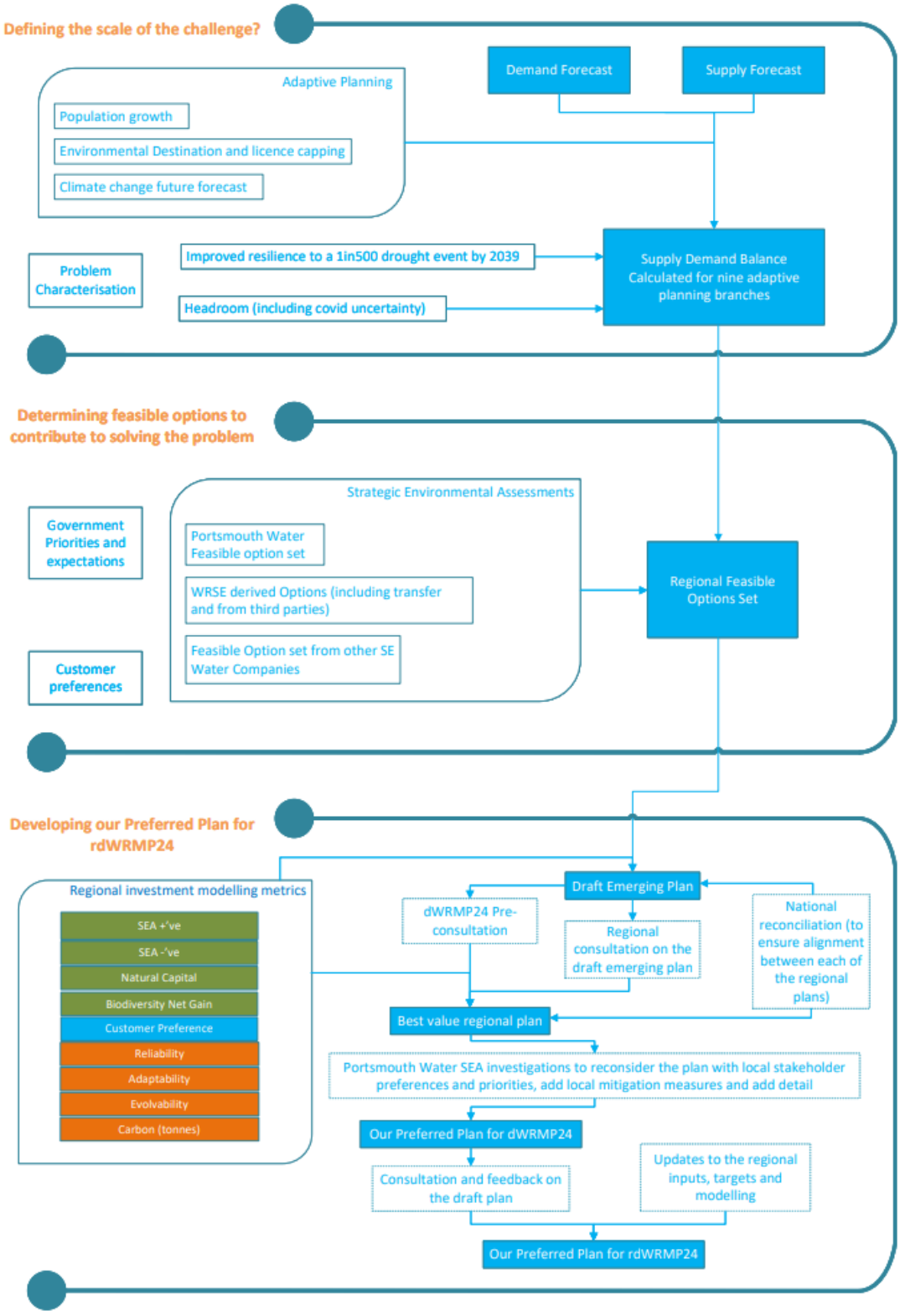


Figure 28: The high-level process of developing this plan

1.9.3 Approach to delivery

The diagram in Figure 29 shows each of the larger building blocks that have contributed to the development of the WRMP24, along with where in this document you can find more information.

Supporting and informing every step has been engagement and consultation within Portsmouth Water, with customers, across the regional planning group, and with stakeholders and regulators.

The colour scheme of the diagram differentiates between steps predominantly led and delivered by us, and those that have been delivered in regional partnership through the WRSE alliance. Many of the steps we undertook ourselves followed regionally consistent methodologies and approaches.

To aid this work, WRSE produced a series of method statements that set out the processes and procedures followed when preparing the technical elements for our regional plan, which in turn have informed this WRMP24. These method statements were shared with stakeholders, consulted on in 2021 to ensure transparency of approach, and then updated to reflect feedback received and as methods have evolved. The method statements and all the other WRSE published reports are available in the WRSE online library: https://www.wrse.org.uk/library.

Where we reference WRSE methods we have included them as appendices to this WRMP.

Some of the WRSE approaches are new, while others are based on established methods which have been widely used by water companies in preparing past water resources management plans.

Through WRSE it was ensured that all processes follow and are compliant with the WRPG and the National Framework.

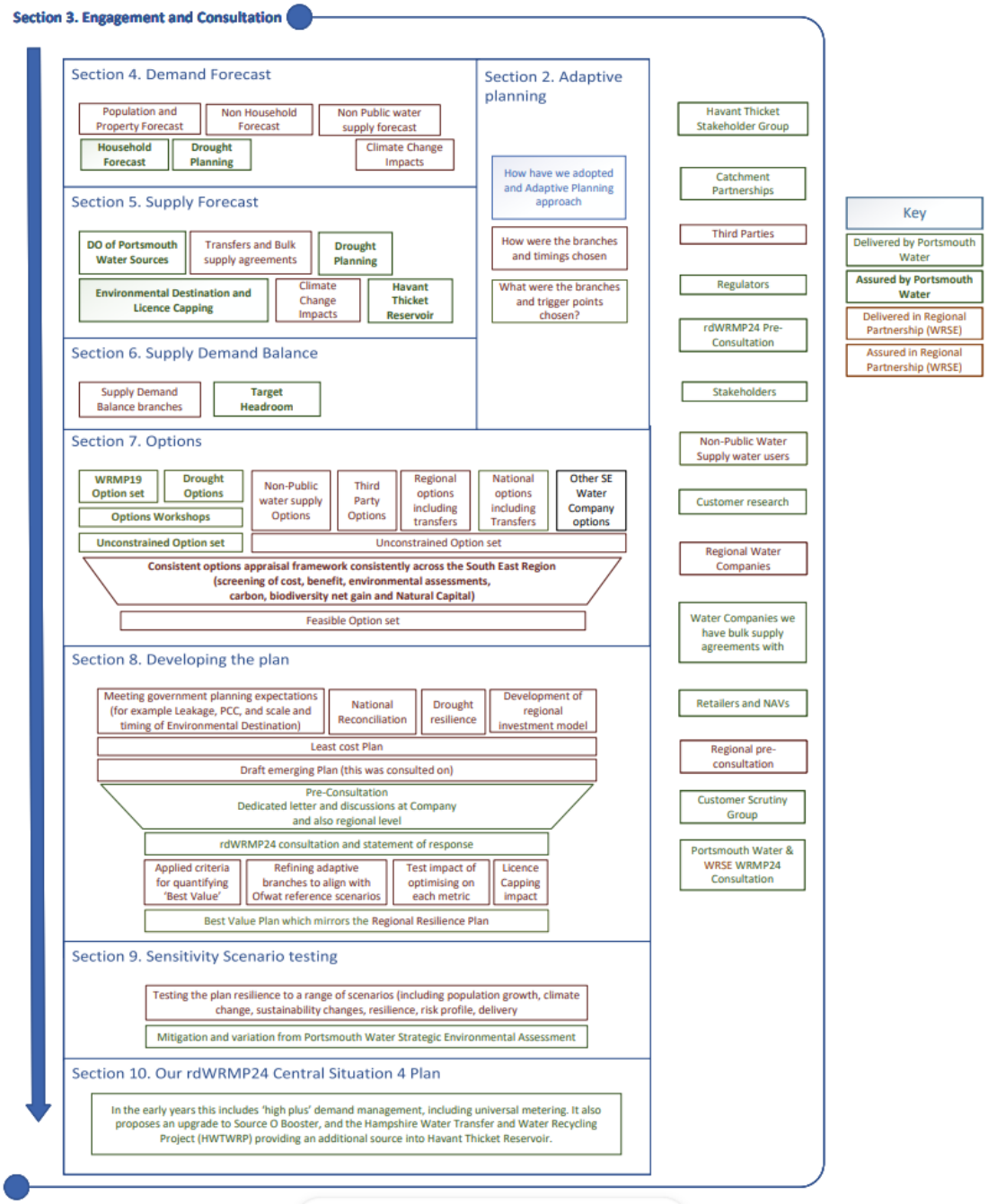


Figure 29: The building blocks of our planning process, showing which have been delivered directly, and which we have delivered collaboratively through the WRSE alliance.

2 ADAPTIVE PLANNING

2.1 Introduction

This section of the WRMP24:

- Introduces the concept of adaptive planning and explains why it is needed.
- Provides an overview of the adaptive pathways developed by WRSE and the alliance of companies including Portsmouth Water.
- Summarises how adaptive pathways are used within our WRMP24.

Subsequent relevant chapters of this WRMP24 report against the adaptive pathways and associated plausible future scenarios detailed here. Within those chapters, components of the plan (i.e. demand, supply) assess and report against relevant variables driving uncertainty in the assessments. Once combined in the supply-demand balance chapter and building the plan chapter, these then build a full picture of the adaptive planning scenarios.

2.1.1 What is adaptive planning?

Adaptive planning is an approach to developing flexible long-term delivery strategies in an uncertain future, by setting out investment options against a wide range of plausible future scenarios (Figure 30). Its purpose is to identify a flexible least-regret portfolio of options based on the comparison of optimal solutions for each plausible pathway.

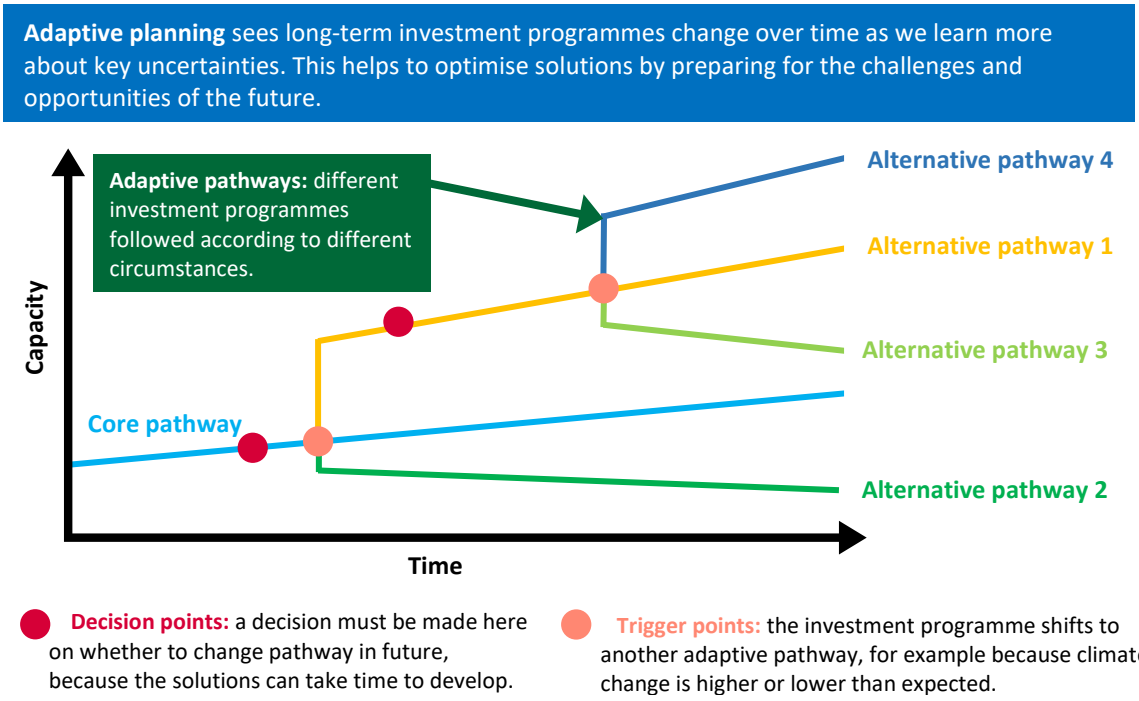


Figure 30: Conceptual diagram demonstrating the approach to adaptive planning and definitions for key concepts of adaptive pathways, decision points and trigger points. Adapted from sources: Ofwat, May 2022; Ofwat, April 2022.

Our long-term adaptive planning strategy consists of a reported pathway (referred to as 'Situation 4') which is consistent with best practice techniques and encompasses the 'low regrets' investments that are identified as necessary in all plausible future scenarios. We then seek to define other pathways, which represent lower challenge 'benign' scenarios and

higher challenge 'adverse' scenarios. Understanding what causes these other pathways allows us to identify the sensitivity of our planning to other factors such as population growth or climate change. This in turn allows us to understand trigger points for these factors that would point to the need for us to move from our core pathway to an alternative one.

This process accounts for how a water company's long-term strategy is likely to change in the future, in addition to reducing risk of over or under investment. Implementation of modular or flexible solutions provides adaptive capacity to closer reflect required capacity, rather than building traditional large infrastructure solutions now based on future uncertainty (Figure 31).

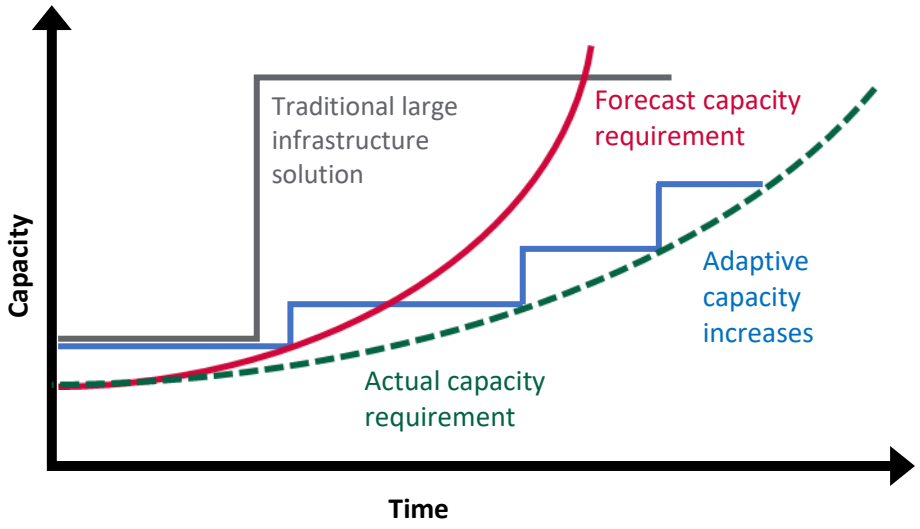


Figure 31. Conceptual diagram for building adaptive capacity. Adapted from Ofwat, April 2022.

2.1.2 Expectations of water companies: an uncertain future

The regulator's WRPG Water resources planning guideline - GOV.UK (www.gov.uk) (April 2023) states that an adaptive planning solution should be considered if there is:

- significant uncertainty, particularly in the first 5 years of your plan.
- a strategic decision in the plan's medium term, which has a long lead-in time.
- large long-term uncertainty which might lead you to consider different preferred solutions.

They stipulate that the adaptive plan should:

- set out at what point each decision will be taken.
- how each decision will be made.
- how the plan will be monitored.
- consider how headroom will be affected.
- ensure that uncertainty is not double-counted.
- clearly report the costs and solution differences between the adaptive pathways.

In November 2021, Ofwat set out their expectations for strategic planning frameworks at PR24. Their letter stipulates a requirement for water companies to employ an adaptive pathways approach within their long-term strategies in order to:

- support decisions using common scenarios representing known issues and future uncertainties.

- link long-term ambition to shorter term deliverables.
- identify low regret interventions to meet needs, allowing for future flexibility
- make decisions based on robust costs and benefits valuation and scenarios-based testing.
- prepare an investment approach to support timely delivery of plans.

"Adaptive planning should be at the heart of the long-term delivery strategy" – *Ofwat, April 2022*

Ofwat have set out common reference scenarios to capture future uncertainties (Figure 32Figure 32). They specify benign and adverse scenarios in climate, technology development, demand (e.g. population and property growth, building regulations and standards), environmental destination or ambition (e.g. abstraction reductions) and other wider uncertainties (e.g. localised or company specific). These scenarios provide a spectrum of plausible extremes upon which to deliver strategies.

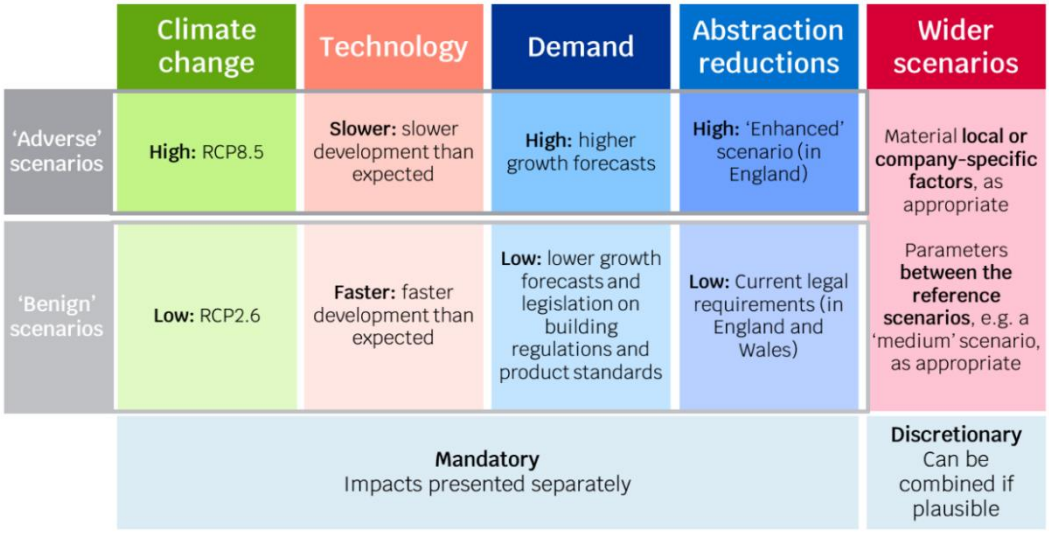


Figure 32: Expectation for scenario testing. Source: Ofwat, April 2022

Our WRMP, in common with the regional resilience plan, is presented in this document as a reported pathway ('Situation 4'), with the investment needed to deliver in that context. Alongside that reported pathway we illustrate alternative benign and adverse futures, that are equally plausible. We articulate the triggers we would use to test our planning assumptions and the necessary changes to our investment plans, should we need to adapt to an alternative pathway.

We have also identified an Ofwat Core pathway (referred to as 'Situation 8') in our WRMP and we considered this alongside other Long Term Delivery Strategy WRSE investment model runs to provide sensitivity testing and to inform our business plan.

2.2 Regional multi-sector planning approach

WRMPs have traditionally published a single forecast future used as the basis to identify options to balance future supply and demand. They have considered uncertain futures through scenario and sensitivity testing of the plan. However, due to the significant range of potential futures and challenges that we face, a refined approach has been identified for WRMP24.

WRSE has collaborated regionally to develop an adaptive planning approach to meet the future water resources challenges in the South East of England. This approach employs a branching approach from the single core pathway. WRSE identified three pathways which

branch from the core at a trigger point in 2035, and a further three pathways branch from each of these pathways from a trigger point in 2040 and stretch out over a 50-year planning horizon from 2025–2075 (see Figure 33). The timing of trigger points was identified following a review of risk-based triggers for variations of population growth, environmental destination and climate change forecasts.

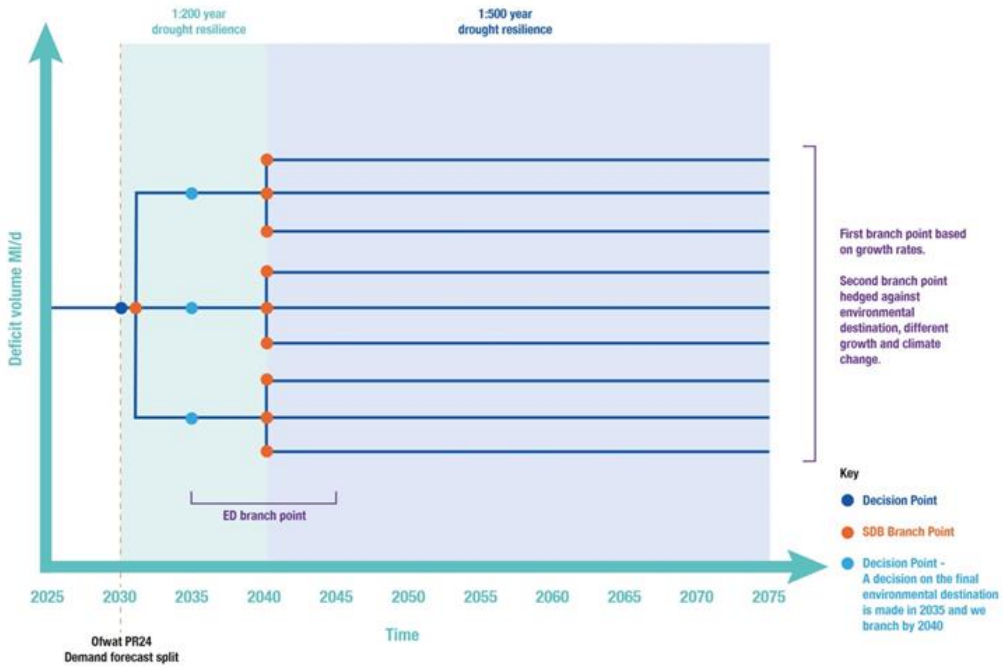


Figure 33: WRSE's adaptive planning pathways.

2.2.1 WRSE adaptive planning scenario factors

2.2.1.1 Population growth

Uncertainty within the predictions of future economic and demographic factors presents a challenge for water resource management.

The UK government stated aspirations to accelerate the rate of house building to 300,000 new homes per year. However, the UK's exit of the European Union and the global restrictions on migration presented by the Coronavirus pandemic means that the UK is facing a unique period of uncertainty politically, economically and demographically. The need for robust evidence on future housing growth and demographic change are key requirements in the WRMP.

The population and property forecasts used in our dWRMP24 have been developed by WRSE (Edge Analytics, July 2020). Several scenario forecasts were generated including trend projections (Office of National Statistics and Greater London Authority), housing-led forecasts (Local Plan, Greater London Authority (GLA), Oxford Cambridge Arc (OxCam)) and employment-led forecasts, founded upon fertility, mortality and migration assumptions. The forecasts were revisited for the rdWRMP24 and updated with new data. These updates are also applied within our final WRMP24.

For the WRSE region, the Low and High population growth averages for the full 2021 – 2050 horizon range from 8.7 per cent to 30.4 per cent. Each company within WRSE had its own forecast which was used in the adaptive planning approach. We have accounted for

population uncertainty using different housing and population scenarios within our demand forecasting.

2.2.1.2 Environmental destination

Sustainably abstracted water bodies are more resilient to climate change and drought (EA, March 2020). There is rising awareness that the water bodies in our supply area are under increasing pressure with an assumption that the abstraction of water for public water supply is a component of that pressure. In close consultation with the Environment Agency, we have sought to understand the possible range of reductions in abstraction we might foresee in the future to raise the resilience of water bodies in our area.

Exact site by site reduction levels have yet to be established, but to allow this plan to account for this significant pressure, we have modelled the possible impact of reductions as 'environmental destinations'. This approach, endorsed by the Environment Agency in the National Framework, gives the scale of possible reductions a value at our full water resource zone level.

Collectively, the companies in WRSE considered seven environmental destination scenarios in total (BAU, BAU+, Enhance, Adapt, Combine, Central and Alternative). Following collaboration with Environment Agency, four scenarios were initially taken forward for inclusion in investment modelling for the emerging regional plan. Following a series of workshops held with catchment partnerships and other local stakeholders (WRSE, January 2022) these were deemed to reflect the range of environmental ambition for the region.

However, following investment modelling and adaptive planning towards the development of the draft regional plan, the four options were subsequently consolidated to three environmental destinations: 'High', 'Medium' and 'Low'. Further detail is provided in Section 5.4.

The range of values expressed in these environmental destinations have significant effects on regional plan.

2.2.1.3 Climate change

Under future climate, we are facing hotter, drier summers, and warmer wetter winters, bringing new challenges to delivering and securing resilience of water resources. Since our last plan (WRMP19), new climate projections have been produced (UK Climate Projections (UKCP) - Met Office; known as the UK Climate Projects 2018, UKCP18) using the most up to date and best climate models from the UK and around the world.

WRSE carried out water resources system modelling to determine 28 'equally likely' climate change scenarios for the highest emissions scenario RCP8.5 (Global Climate Models, (GCMs) and Regional Climate Models (RCMs))[16], which represent the range of uncertainty present in the UKCP18 products. As part of our WRMP24 we have assessed deployable output under each of the 28 climate models using the full stochastic dataset and our Pywr[17] model. Additional information on this process is provided in Section 5.5. This data was then provided to WRSE where results were then scaled between different emissions scenarios to provide supply forecasts for high, medium and low climate change future scenarios.

[16] RCP is the representative concentration pathway, indicating the level of emissions. RCP8.5 is equivalent to ~4°C of warming by the end of the century, compared with ~2°C by the end of the century for RCP2.6.

[17] python-based water resource modelling platform called 'Pywr'. Tomlinson, J.E., Arnott, J.H. and Harou, J.J., 2020. A water resource simulator in Python. Environmental Modelling & Software. https://doi.org/10.1016/j.envsoft.2020.104635

2.2.2 Scenario selection for adaptive pathways

As part of the WRSE scenario selection process, 580 different potential futures were initially identified based upon 5 different population growth scenarios, 29 climate change scenarios and 4 different environmental destination scenarios. These futures encompass each of the different planning scenarios of Normal Year Annual Average (NYAA), Dry Year Annual Average (DYAA), Dry Year Critical Period (DYCP) and different drought conditions (e.g., 1-in-100 year, 1-in-500 year). This results in a significant range of possible forecasts across the South East region. It is this range of potential futures challenge that drives different investment choices. To select the most appropriate pathways, WRSE has undertaken investment model runs using various iterations of these possible futures (pathways), which have then been tested and assessed by Portsmouth Water and the other water companies. Analysis of these pathways have identified two key time periods:

2025–2035 Priority 'least regrets' plan: This period includes the schemes that water companies must progress. These schemes are required in all the future pathways and are considered 'least regret' options. This period will also include preparatory work necessary to assess the feasibility and effectiveness of options that could be needed in later years. Uncertainty in our assessments is accounted for within a target headroom allowance during this period.

2035–2075 The adaptive plan: This period is more uncertain and so includes a strategy to deal with different futures through nine representative alternative pathways. Each pathway represents a different combination of population growth, environmental destination and climate change scenarios and includes the schemes needed under each. Collectively the 9 pathways encompass the full range of impacts from the 580 possible futures identified initially. The plan will adapt depending on which future scenario occurs.

2.2.3 Our adaptive planning scenarios

We have adopted the adaptive planning pathways and scenarios developed by WRSE. These have been produced in accordance with Ofwat's guidance to plan for future uncertainties and to comply with the WRPG. Our adaptive planning pathways are outlined in Figure 34 and the definition and source of individual scenario components are detailed in Table 7.

Several of the WRSE pathways are heavily impact by the possible 'Oxcam' and 'hplan' developments (Table 7), which significantly increase population growth scenarios. Because our area will not be directly impacted by these developments these pathways do not impact our demand and supply assumptions. However, due to the interconnectivity of supply systems planned, it is possible these developments might affect the options selected for our supply area.

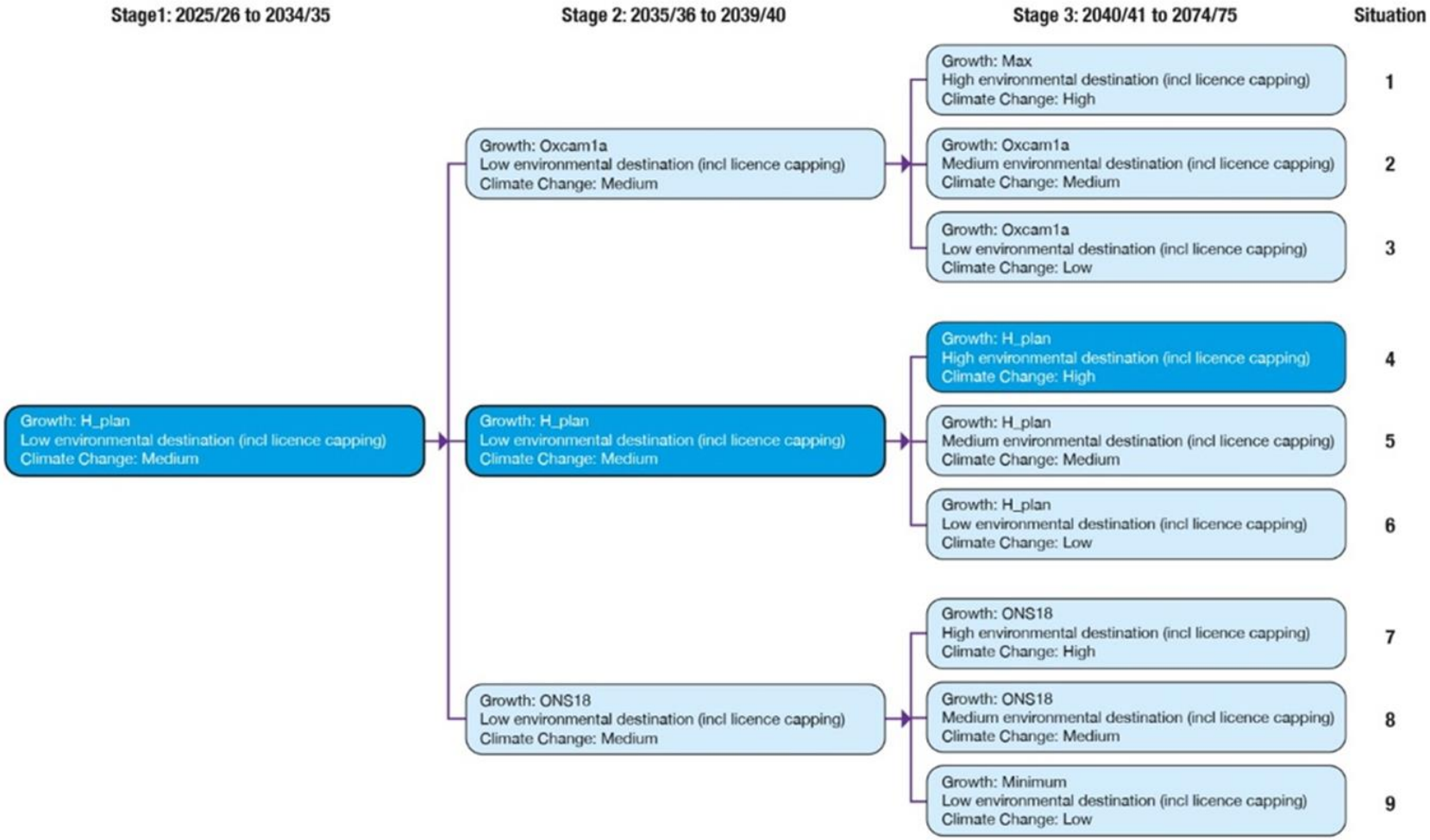


Figure 34: Portsmouth Water's Adaptive Planning branches with the core pathway highlighted.

Table 7 Definitions of adaptive pathway components

Component	Scenario	Definition and source
Housing and population growth (Growth)	hmax	Housing-led forecast (Housing-need; 2020–2050)*. A Housing-led scenario, with population growth underpinned by the trajectory of housing growth associated with each local authority's Local Housing Need (LHN) or Objectively Assessed Housing Need (OAHN). Following the final year of data, projected housing growth returns to the ONS-14 and ONS-16 long-term annual growth average by 2050. (Edge Analytics, July 2020)
	Oxcam1a	Housing-led forecast (2020–2050)*. 'New Settlement' 23k dpa scenario, with circa 4,200 dwellings per annum (dpa) above Housing Plan. Household representative rates for young adults returning to (higher) 2001 levels by 2039, remaining fixed thereafter. (Edge Analytics, July 2020). Due to insignificant differences in outputs between Oxcam1a and hplan, hplan is used in place of Oxcam1a for our plan.
	hplan	Housing-led forecast (2020–2050)*, with population growth underpinned by each local authority's Local Plan housing growth trajectory. Following the final year of data, projected housing growth returns to the ONS-14 and ONS-16 long-term annual growth average by 2050. (Edge Analytics, July 2020)
	ONS18	Trend forecast. ONS 2018-based Principal sub-national population projection (SNPP), using a five-year history (2013–2018) to derive local fertility and mortality assumptions and a long-term UK net international migration assumption of +190,000 and a two-year history (2016–2018) of internal migration assumptions. In line with the ONS 2018-based national population projection (NPP), this round of projections includes a reduced UK fertility outlook compared to ONS-16 and a dampened rate of improvement in life expectancy compared to ONS-16. (Edge Analytics, July 2020)
	hmin10	Trend forecast. ONS 2018-based Low International Migration sub-national population projection (SNPP), incorporating a Low long-term UK net international migration assumption of +90,000 per annum, with all other assumptions consistent with ONS-18. (Edge Analytics, July 2020)
Environmental destination (Env. destination)	High	The 'High' scenario reflects the Environment Agency's Enhance and BAU+ (locally verified) scenarios. This high abstraction reduction scenario meets the current expected level of abstraction reduction set by the Environment Agency.
	Medium	The 'Medium' scenario was proposed by us and refined with the Environment Agency; it assumes licence reductions that, at a water resource zone level, are representative of the Environment Agency's BAU scenario.
	Low	The 'Low' scenario represents our best estimate of potential licence capping impacts to address WFD no deterioration risks.
Climate Change (CC)	CC06	Upper quartile of 28 UKCP18 climate change scenarios. These will be the 12 regional projections, the 3 global projections from the Hadley Model which were not run through the regional climate model, and the 13 global projections from the CMIP5 ensemble.
	Medium	Median of 28 UKCP18 climate change scenarios, as described above for CC06.
	CC07	Lower quartile of 28 UKCP18 climate change scenarios, as described above for CC06.

Key: benign scenarios; moderate scenarios; adverse scenarios.

*Growth scenarios for 2050–2075 are underpinned by fertility, mortality and migration assumptions from the ONS 2018-based NPP, configuring a principal, low and high growth outcome

2.3 Implementing our adaptive planning scenarios within our WRMP24

To develop our WRMP24, we have produced supply-demand balances for each of the nine adaptive pathways. Below we stipulate how the components of each pathway are considered for our demand forecast, supply forecast and subsequently the supply-demand balance.

2.3.1 Demand forecasting

Within the short term (2025–2030), demand forecasts (see Section 4) reflect the core pathway, which utilises the hplan housing plan, a low environmental destination and the medium climate change projections. Beyond 2030, our demand forecasts then explore uncertainty in growth by utilising different housing plan forecasts e.g. ONS18. Demand forecasts have been produced for the NYAA, NYCP, DYAA and DYCP planning scenarios for all pathways, where demand for the Dry Year scenarios represents the 1-in-20 year condition.

2.3.2 Supply forecasting

Within supply forecasting, the high, medium, and low environmental destinations were considered to reflect a suitable range of uncertainty in plausible abstraction reductions (see Section 5.4). This included the development of stepped profiles for sustainability reductions, with initial reductions commencing in 2030 and final reductions occurring in 2050.

The low environmental destination was selected for the short to medium term period (2025–2040) considering regulatory drivers for the range of adaptive planning branches. This includes the Ofwat low regret approach to adaptive planning, including sustainability reductions already included in WINEP. Beyond 2040, our supply forecasts explore uncertainty in our environmental destination i.e. the low, medium and high environmental destinations.

Environmental Destination profiles have been revised since the dWRMP24 in light of regulator and stakeholder feedback. This has resulted in greater potential sustainability reductions, being delivered sooner to meet the enhanced scenario (high). Please refer to Section 5.4 for further information.

Three sets of climate change impacts were also applied to the supply forecast reflecting high, median and low DO impacts (see Section 5.5). The medium scenario was used in the short to medium term period (2025–2040) and beyond that the supply forecasts explore all three scenarios (low, medium and high). This can be summarised as:

- Situations 1, 4 and 7 include assumptions of high climate change impact.
- Situations 2, 5 and 8 include assumptions of medium climate change impact.
- Situations 3, 6 and 9 include assumptions of low climate change impact.

2.3.3 Uncertainty

A ‘Target Headroom’ factor was included in our calculation of the supply demand balance to account for the uncertainties within both the supply and demand forecasts. In determining target headroom, we considered the appropriate level of risk for our plan. If target headroom is too large it may drive unnecessary expenditure. If it is too small, the risk is that we may not be able to meet our planned level of service.

Collaboratively as part of the WRSE group our approach to Target Headroom has been revised for this WRMP24 plan. The new approach seeks to avoid the potential of doubling counting uncertainties that are already explored and accounted for within the adaptive planning branches.

More information about our calculation of target headroom can be found in Section 6.3 and Appendix 6A.

2.3.4 Supply-demand forecast and options selection

Once the supply and demand forecasts were produced for each pathway, the WRSE model tested the range of options for all pathways and scenarios to identify a set of low-regret options that can solve all pathways and scenarios. Based upon this root and branch adaptive pathway tree, the plan can ensure options are chosen at the beginning of the plan that remain effective for future challenges. The preferred best value plan then includes further options that are considered to provide best value, limiting the potential for wasted investment weighed across the initial and future periods, under all situations (Figure 35).

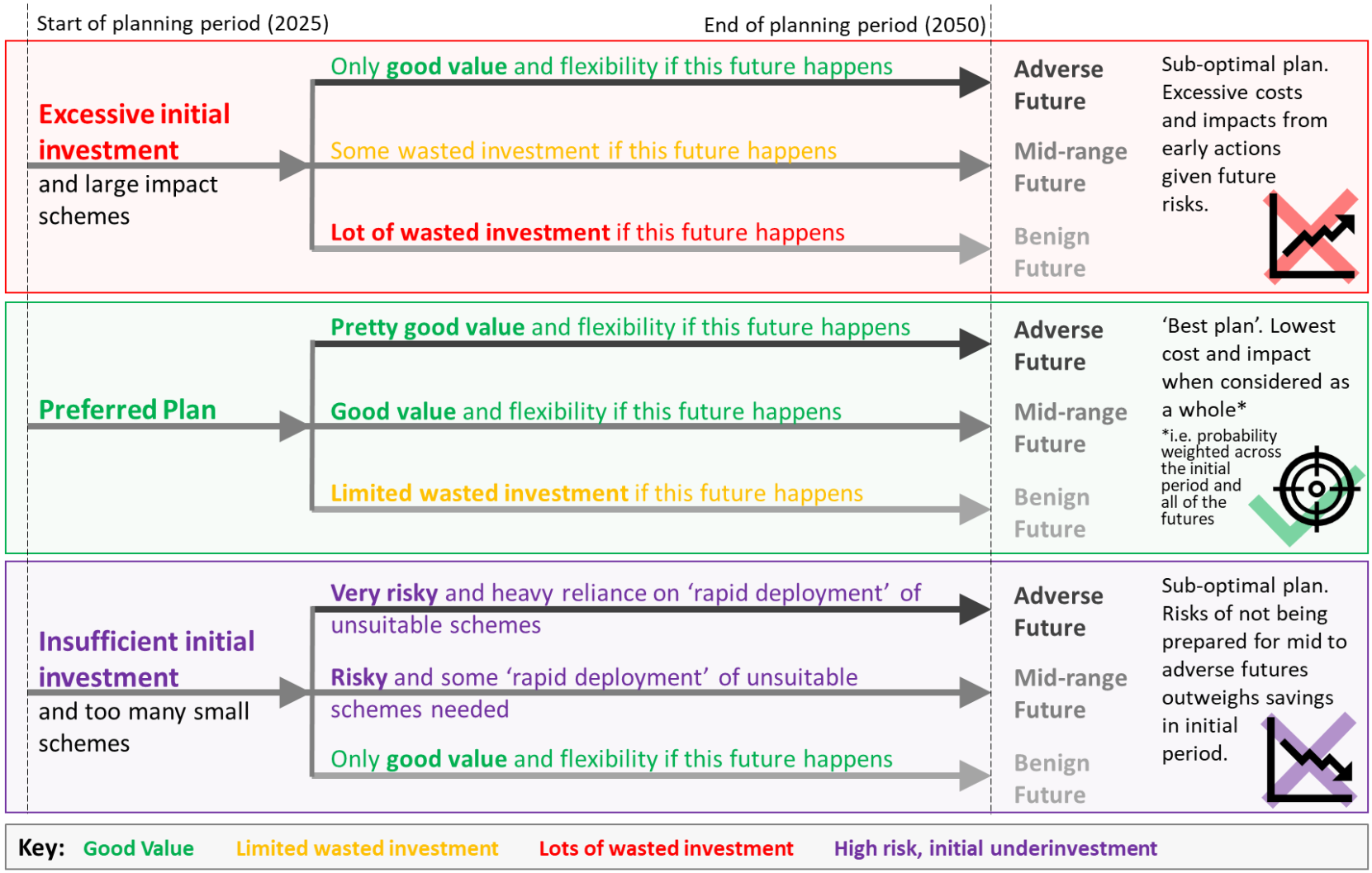


Figure 35: WRSE's approach to the preferred plan using adaptive planning.

3 ENGAGEMENT AND CONSULTATION

3.1 Overview

We pride ourselves in being a community focused water company. Engaging with our stakeholders is important to us, especially when thinking about decisions for the future. We take an evidence-based approach to put the views of our customers and stakeholders at the heart of shaping our business and the way we operate.

Engaging with our customers, regulators, and other stakeholders has enabled us to incorporate their expectations and priorities right at the start of this planning process. Our engagement activities have been designed to inform both the WRMP24 and our Business Plan (PR24).

Some strands of our customer and stakeholder engagement continue and build on our previous initiatives, whereas other aspects are new. The WRMP24 is collaborative to its core, with many fundamental building blocks of the plan having shared methodologies. We have actively participated in the new and wider engagement activities of the regional plan through WRSE and with the National Framework through RAPID and the Strategic Resource Options (SRO).

On 15th November 2022 we published our draft Water Resource Management Plan 2024 (dWRMP24) for consultation. The public consultation ran for a 12-week period and closed on 20th February 2023. We would like to thank all the individuals who shared their views, and the views of organisations they represent, during this public consultation.

We invited feedback on our dWRMP24 through a variety of routes. This was with the aim of reaching out to and engaging as many people as possible. Receiving feedback through several routes provided the opportunity to compare and validate the findings across the different research methods, giving us greater confidence that we were correctly understanding the views of our stakeholders and customers.

3.1.1 Customer research

We commissioned research into customer priorities for water resources, long term supply-demand choices, and investment decisions. This research has acted as a check on the modelling outputs of the WRSE regional investment modelling and informed our PR24 Business Plan.

To build on existing knowledge and evidence and to determine where customer research would be most useful, we first analysed over 30 existing reports for common themes and existing evidence.

Customers participated in focus groups and surveys to validate these findings and investigate specific topics, such as customer views on metering and future developments to Havant Thicket Reservoir.

The views of customers about the challenges we face are included in Section 1. Customer's preferences on specific options are included in Section 7 and have informed a metric which has been used to develop the preferred best value plan as described in Section 8.

3.1.2 WRMP Pre-consultation

As part of the formal dWRMP24 pre-consultation, we wrote to regulators and stakeholders to inform them about our process, approach, and draft emerging results. We also consulted on the SEA scoping report.

Our pre-consultation letter was sent to the Statutory consultees named in the WRPG, and also to individuals and organisations who had previously engaged with our Drought and/or Water Resources Plans, or the development of the Havant Thicket Reservoir. We also invited all Retailers and New appointments and variations (NAVs) to participate in our pre-consultation. A copy of the letter is provided in Appendix 3A.

We have incorporated discussions around our approach to WRMP24 into our existing conversations with stakeholders and regulators. Examples of this include our participation with the Arun and Western Streams catchment partnership group, discussions with Friends of the Ems, and in discussions around the development of the Havant Thicket Reservoir.

3.1.3 Regional collaboration and shared pre-consultation activities

Engagement with our neighbouring water companies, and more widely across the region has been fundamental to the development of this WRMP24. We have developed regional options, collectively consulted on an emerging regional plan, and co-created shared approaches and methodologies.

Through the WRSE group, we engaged in regular dialogue with regulators and stakeholders as well as consulting widely on method statements and pre-consulted on the emerging regional plan.

We have encouraged our stakeholders to engage with the development of the regional plan through webinars, presentations, and consultation documents on the development of the policies, technical methods, solutions, and programme appraisal.

WRSE has produced a Stakeholder Engagement Report which summarised the extensive engagement and consultation activity that has taken place to date[18]. The report was published alongside the emerging plan in January 2022 and contains further details of the 40-plus engagement events held to date, including sessions with Local Authorities, Retailers, 'Blueprint for Water', National Infrastructure Commission, National Farmers Union (NFU) and the Horticultural Traders Association.

This regional engagement has been particularly successful in understanding views on topics that affect several water companies, for example the Southern Water options that interact with Havant Thicket Reservoir.

An example of where pre-consultation has directly influenced this WRMP24 has been the introduction of earlier branching on population growth, environmental destination and climate change forecasts within the adaptive planning compared to the WRSE emerging plan consulted on during January to March 2022. The selection of adaptive planning pathway 4 (also referred to as 'situation 4' within the WRSE investment model) as the reported core pathway for our WRMP24 is another example of how regulatory engagement has contributed to key decisions taken during this process.

3.1.4 Public Consultation on our dWRMP24

To ensure our plan was accessible to a wide range of stakeholders and customers, we produced a non-technical stakeholder summary, alongside the plan and more technical supporting appendices, and made this available to be viewed and downloaded on our website. A list of key consultation activities is provided in Figure 36.

[18] stakeholder-engagement-report-january-2022.pdf (wrse.org.uk) - https://www.wrse.org.uk/media/0f5l4ug4/stakeholder-engagement-report-january-2022.pdf

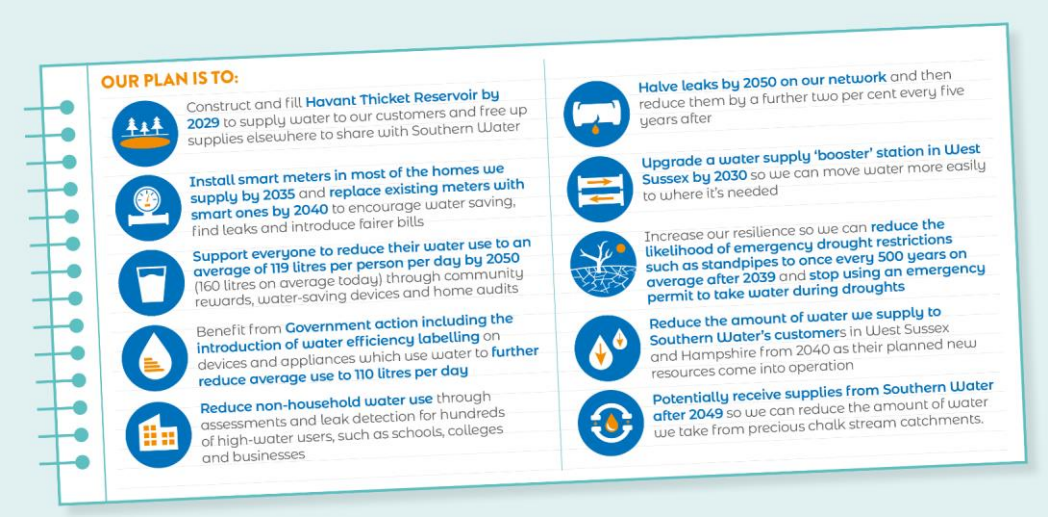


Figure 36: a summary of our plan contained within the non-technical summary

We invited representations on the dWRMP24 to be sent to the Secretary of State, in accordance with requirements prescribed in Section 3.6 of the water resources planning guideline[19].

As well as welcoming written consultation responses, to promote wider engagement we encouraged people to complete a survey hosted on our website. We also promoted the consultation on social media (Figure 37).

Figure 37: a social media post encouraging customers to share their thoughts about the dWRMP24

A number of these consultation activities were undertaken in partnership with Southern Water due to the high interconnectivity of customers and shared options in WRMPs of both water companies (Figure 38).

[19] Water resources planning guideline - GOV.UK (www.gov.uk)

Figure 38: Signs in place at Havant Thicket Reservoir site encouraging people to share their thoughts on our dWRMP24 as well as that of Southern Water.

Other activities were carried out at regional level as part of the WRSE group (Figure 39) who ran a consultation in parallel with our own, consulting on the draft best value regional plan for water resources across the South East region[20]. Table 8 details the timeline of activities.

Figure 39: WRSE Director, Trevor Bishop, promoting the consultation on the regional resilience plan for water resources at a parliamentary event on the 16th November 2022

[20] Our draft best value regional plan | Water Resources South East (engagementhq.com)

Table 8: Timeline of dWRMP24 consultation activities

Date	Engagement activity and reach - How many People were engaged
15th November 2022 – Consultation starts	• Information and links on Portsmouth Water website go live with documents, survey and WRSE information • Press release sent to around 50 contacts including local media, BBC and trade press. • Email sent to nearly 400 stakeholders including MPs, local authorities, developers, Environment Agency, Forestry Commission etc. • LinkedIn post which received 2,122 views, 89 clicks and 50 reactions • Workplace post to staff was viewed 149 times receiving 4 reactions
16th November 2022	• WRSE launch event for the draft regional plan was held at the Houses of Parliament in London. Although this was a launch event for the draft regional plan, the dWRMP24 Consultations of each of the six companies that work together as a region, was signposted, including our own. This was attended by Bob Taylor, Chief Executive Officer, Portsmouth Water. More than 60 stakeholders attended including MPs, regulators, environmental groups, local authorities, trade associations for large water users and other water resources regions. South East MPs and peers from the House of Lords also attended with Chairs of parliamentary select committees and All Party Parliamentary Groups (APPGs).
30th November 2022	• Presentation to Havant Thicket Reservoir stakeholders
1st December 2022	• Webinar reminder email for stakeholders • Email sent to all retailer contacts
6th December 2022	• Email sent to catchment management contacts
7th December 2022	• Webinar for stakeholders was jointly hosted between ourselves and Southern Water 7 Dec 2022 Portsmouth Water / Southern Water dWRMPs consultation webinar on Vimeo Over an hour and a half, presentations provided an overview of the regional water resources context as well as our Portsmouth Water dWRMP24 proposals and the Southern Water dWRMP24 proposals with Q&A sessions after each presentation. There were 67 attendees at the webinar, in addition to the presenters and administrators. These came from a range of organisations including: ○ Council officers and councillors from parish councils, Winchester, Chichester, Horsham, Fareham, Arun, West Sussex, Isle of Wight, Test Valley and Havant councils ○ MP representatives ○ Environment Agency and Natural England ○ CCW ○ Arun and Rother Rivers Trust (AART) ○ Businesses
Between 7th – 16th December	• Customer direct emails

12th December 2022	• Presentation to Customer Scrutiny Panel
28th December 2022	• Social media campaign starts Our Facebook post received 931 views, and reached 769 people, 127 of whom engaged with it.
9th January 2023	• Customer emails restart
11th January 2023	• Bob Taylor, Chief Executive Officer, and Stephen Cox, Water Resources Manager, brief management at Havant Borough Council
16th January 2023	• E-Newsletter sent to 426 recipients who had previously requested updates relating to Havant Thicket Reservoir
Between the 13th and 30th January 2023	• Wave 4 of 'Water Talk', the consumer panel 434 Portsmouth Water bill payers who are part of the 'Water Talk' panel took part in an online multiple-choice survey. More information about this survey is in Section 3.8.3.
3rd February 2023	• Signs in place at the Havant Thicket Reservoir site
15th February 2023	• Bob Taylor, Chief Executive Officer, attended a public meeting in Havant hosted by Havant Borough Council on the topic, Hampshire Water Transfer and Water Recycling Proposal[21]' • Approximately 70 organisations with connections to the Havant Thicket Reservoir project attended, including Forestry England, Havant and East Hants councillors, voluntary organisations and environmental groups

Where appropriate, dedicated meetings were held to discuss detailed consultation responses and ensure we understood the respondents' perspectives and talked through our proposals to address these.

We held dedicated meetings with the Environment Agency and Ofwat on 3rd April 2023 and 19th April 2023 respectively. During these meeting we reviewed consultation responses received to confirm and define regulatory expectations and talked through proposed approaches to address and resolve the comments received.

3.2 Listening to and responding to public consultation feedback

In total, we received 708 individual responses to our dWRMP24 consultation from customers and organisations. These consisted of 159 emailed text responses[22], in addition to multiple choice data from 434 customer panel surveys and 115 website surveys (that contained both multiple choice questions and the opportunity to add commentary text). We accepted and included responses received after the end of the consultation deadline.

The data within the surveys is largely quantitative. This enables us to look across the responses to compare trends and the most common views about the topics we asked about. Comparing responses to topics that were asked about in both the customer panel (the Barometer) and the website survey gives confidence in the validity of the results. We used the overall findings and trends shown in these survey results to influence the continued development of our WRMP24.

There was an opportunity at the end of the website survey for respondents to write any other thoughts and comments they wanted to share with us. Of the 115 website surveys

[21] The presentation slides for this public meeting were jointly produced by ourselves and Southern Water and are published on the Havant Borough Council Website - Welcome (havant.gov.uk) https://cdn.havant.gov.uk/public/documents/HBC%20public%20mtg%20Feb%202023.pdf

[22] This includes 21 regulatory queries from Ofwat during the consultation process

completed, 79 respondents chose to provide written commentary in the text box provided and these comments were considered in the same way as other written consultation responses received through emails.

The written consultation responses provided detailed insight into the views of customers, regulators, and stakeholders about specific areas of our dWRMP24. We read each of these and identified 1,292 separate comments from the 159 email responses and 115 website surveys[23].

Over half the comments we received were about supply options, and these were dominated by feedback about the Hampshire Water Transfer and Water Recycling Project. Demand options, and then our environmental assessments, and supply forecast were the next most commented on areas of our plan. Collectively, these four areas of our plan attracted over eighty percent of the feedback comments we received through the public consultation of our dWRMP24.

Each of the 1,292 comments are individually reported along with our response and resulting changes to our WRMP in the Statement of Response report that was published alongside our rdWRMP24 in August 2023.

Following submission of our rdWRMP24 we also received a further information request from Defra. Our response in April 2024 forms part of our Statement of Response and has resulted in additional updates to this final WRMP24.

3.3 Board engagement and how our employees have helped shape this plan.

Employees from across our business helped to inform this WRMP24. A key area for employee engagement was during the identification of unconstrained options at workshops held with operational staff. Staff were actively encouraged to comment on the public consultation of the dWRMP24 and also contributed to the Lessons Learnt exercise following Summer 2022. More detail on this is presented in Section 7.2.1 and Appendix 7A.

Our Board engaged with and contributed to the development of the WRMP24. The process has the same overarching governance and delivery structure as our other planning processes, such as the PR24 Business Plan, the Drinking Water Safety Plan and our Plan for Net Zero. The structure is designed to ensure we understand and address the interdependencies so that the plans align and that common datasets are used.

The Board signed off the dWRMP24 in September 2022. In the two years running up to this point, they reviewed the monthly updates on programme progress and key developments. Board papers were presented and discussed in Spring 2021, November 2021, May 2022 and July 2022 on proposed approaches and initial results. For the rdWRMP24 the board were updated on changes via three board papers. The Board have authorised and approved this final WRMP24.

At a more tactical level, a dedicated WRMP Steering Group of key internal stakeholders from across our company has met monthly to:

1. Ensure the visibility and buy-in of the dWRMP24 development and decision-making process with key representatives in Portsmouth Water.
2. Provide the linkages between the WRMP24 process and wider business functions, including Business Planning for PR24 and Net Zero, so that the relevant outputs from WRMP24 are taken forward into the Business Plan for the 2025 to 2030 period.

[23] There were a further 44 comments which were logged for completeness but they were incorrectly sent to Portsmouth Water, were duplicates or there was no commentary provided.

3. Promote quality assurance by facilitating an internal check and review function.

The Steering Group Terms of Reference are provided within Appendix 11B.

3.4 How regional collaboration has shaped our plan

Our WRMP24 has been co-created with other water companies who operate in the South East of England as part of the WRSE group. Working with the other companies we agreed the appropriate level of collaboration, particularly on shared approaches and methodologies, the commissioning of regional data sets, a common shared investment model, and regionally-focused engagement to support the development of the regional plan and therefore this WRMP24.

We have actively collaborated with Southern Water to ensure the two companies' WRMPs are aligned regarding volumes and timings of transfers and operational agreements especially during drought situations and regarding options, of which Havant Thicket Reservoir is a key component. We have worked particularly closely on several fronts:

- Southern Water is the wastewater provider to our supply area. Our demand forecast influences their anticipated wastewater flows in their Drainage and Wastewater Management Plan (DWMP). This consideration of the whole water cycle has led to the development of water recycling options.
- We have existing bulk supplies with Southern Water. We have agreed a common set of assumptions for the baseline supply forecasts of both plans.
- Our Drought Plans are closely aligned and during periods of dry weather, such as Summer 2022, we have weekly joint operational meetings and discuss drought monitoring triggers.
- Our baseline supply forecast, set out in Section 5, contains details of the Havant Thicket Reservoir scheme currently under development. This is a joint scheme within our supply area but is funded by Southern Water (who are the main beneficiaries of the water).
- As set out in Section 7.8, we have worked together with Southern Water to develop shared options for the WRSE regional plan and our dWRMP24s.
- Two new appendices have been jointly written and developed which have been included in this WRMP24 between ourselves and Southern Water in response to the comments received during the public consultation on the dWRMP24. These relate to bulk supplies (1C), and also the Hampshire Water Transfer and Water Recycling Project (7F).

3.4.1 Engagement carried out with Southern Water specifically to explore potential future uses of Havant Thicket Reservoir

Extensive stakeholder engagement has been carried out by both Portsmouth Water and Southern Water in relation to possible further development of Havant Thicket Reservoir to allow for recycled water from Southern Water's Budds Farm wastewater treatment works to be used as a source of raw water for the reservoir (the Hampshire Water Transfer and Water Recycling Project, HWTWRP).

Stakeholders including MPs, councillors, members of local community groups, representatives from statutory bodies and environmental groups, have been given detailed briefings. There have also been organised visits to the wastewater treatment works, which is the proposed source of the recycled water, and the Havant Thicket Reservoir stakeholder site, to see and hear more about the proposals.

This was followed by Southern Water's six-week consultation, which ran from 5 July to 16 August 2022. The consultation and related events were publicised via a variety of different channels including local newspaper advertising, social media, the Havant Thicket Reservoir E-

Newsletter and website, posters at community venues including Staunton Country Park and flyers.

Over the six weeks, almost 900 people attended six drop-in sessions held in community venues and shopping centres. Southern Water also held three webinars where customers could find out more about the plans. A virtual room was also set up online where people could view the consultation brochure, search maps, and give their feedback on the plans.

In addition to the dedicated consultation on the scheme, both Portsmouth Water and Southern Water received a number of dWRMP24 consultation comments on the HWTWRP. Since the consultation, we have worked with Southern Water to develop responses to these consultation comments which have been summarised in a new joint Appendix 7F. Section 5.2 of that appendix details the next stages of the option development, and includes the plans for future stakeholder engagement.

Because the HWTWRP scheme primarily benefits the supply demand balance in Southern Water's Hampshire supply zone, the detail of these schemes feature in Southern Water's WRMP24.

3.5 SEA scoping report and environmental report consultation

Our Strategic Environmental Assessment (SEA) scoping report was circulated to key stakeholders and regulators on 14 March 2022.

The statutory consultee bodies required under the Environmental Assessment of Plans and Programmes Regulations 2004 are Natural England, Historic England and the Environment Agency. Local Authorities in the plan area were also consulted.

Consultation was aimed at ensuring that the SEA would be comprehensive and robust in supporting the dWRMP24 by gathering early views on how the plan should be developed. Comments were sought on how the evidence-gathering and proposed approaches could be improved or clarified. In addition, the Scoping Report also aimed to seek views on the assessment approaches and ensure that environmental issues relevant to the Portsmouth area were identified, considered and addressed. The helpful responses we received have been incorporated into the development of our assessment and subsequently our dWRMP24.

The Scoping Report was used to inform the SEA assessment criteria and ensure alignment with the work being undertaken at the Regional level by WRSE. The outcome of the SEA and specialist environmental assessments (as described in section 1.2, and in 7.4, 8 and 10) was summarised in the SEA Environmental Report which was published for consultation alongside the dWRMP24. This has been amended and updated to reflect the changes arising in the rdWRMP24 and final WRMP24 and also includes further assessment and considerations requested through the consultation process.

3.6 How regional stakeholder engagement has shaped our WRMP24

A continuous thread of engagement throughout the development of the WRSE regional plan has involved a wide range of stakeholders to understand their priorities and preferences, and to take these into account in decisions leading to the best value regional plan. Our WRMP24 reflects the best value regional plan and has therefore also been influenced by this regional stakeholder engagement.

WRSE has established stakeholder groups to help guide the development of the regional plan (Figure 40). The groups are the stakeholder advisory board, environmental stakeholder group and the multi-sector stakeholder group. Our CEO, Bob Taylor, represents Portsmouth Water

on the WRSE Senior Leadership Team which is advised by the Stakeholder Advisory Panel while approving key decisions and programme milestones.

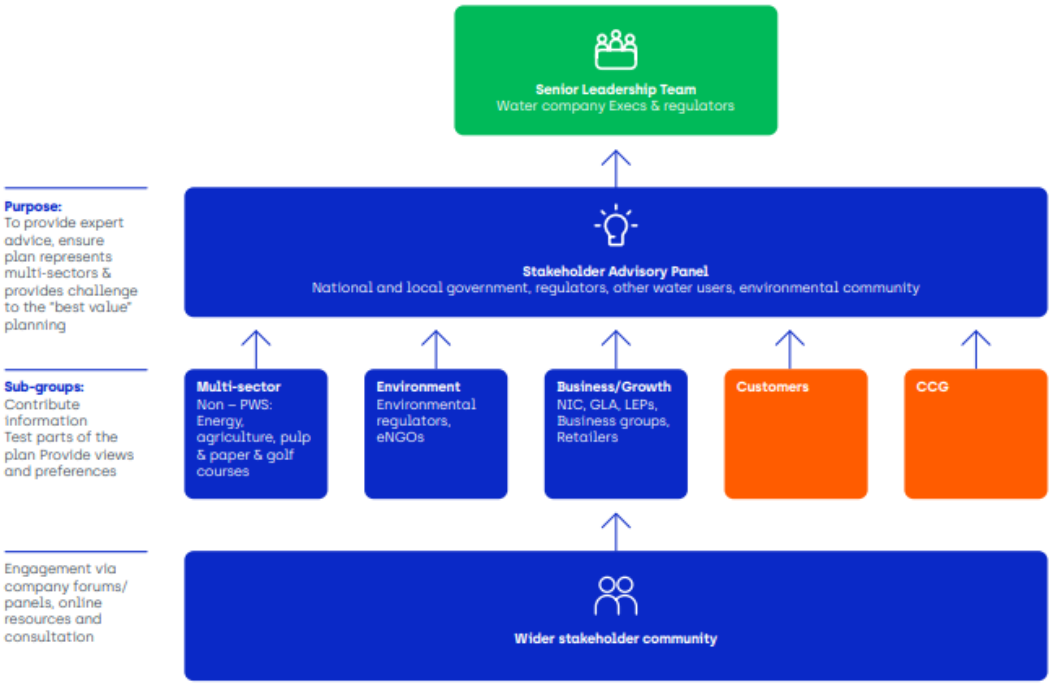


Figure 40: Stakeholder groups for WRSE

In addition to those specific groups, WRSE has proactively engaged with the wider stakeholder community via meetings, webinars and consultations throughout the development of the regional plan.

WRSE has established strong links with other regional groups to ensure the opportunities to share resources effectively are understood and fully investigated and to provide a coordinated national water resources picture.

The WRSE engagement and consultation programme has three main phases:

- **Plan and prepare – up to 2020**, focus was on the 'building blocks' of the regional plan. This included the technical methods, approaches and tools that would be applied in the development phase, for example, the forecasts for future growth and demand for water; the environmental assessments; and the regional policies. WRSE ran a programme of webinars and held topic-specific consultations to give stakeholders the opportunity to engage and input to the process.
- **Develop – during 2021,** the focus broadened and set out the planning challenge for the region, sharing information on feasible solutions, including the Strategic Regional Options (SROs), and formulating the approach to determine the best value regional plan.
- **Consult and update – during 2022-23**, the focus moved to the plan itself. WRSE held an 8-week period of engagement and consultation on the 'emerging' regional plan in January 2022. This led to the creation of the best value regional plan. In November 2022, a further round of consultation was undertaken on the best value plan, when the regional plan was published, alongside the statutory consultation on the draft WRMP24s. A revised regional plan has since been produced, which is reflected in our WRMP24.

3.7 Incorporation of customer preferences in optimisation modelling

In 2021, a survey was undertaken across the South East region to see what customers thought a good plan should cover and how much weight they put behind certain criteria. The survey results are shown in Figure 41.

By combining the output from the best value plan metrics with the customer preferences at a regional level, we have been able to develop a customer weighted approach to appraising the regional plan, which has in turn informed our own Plan.

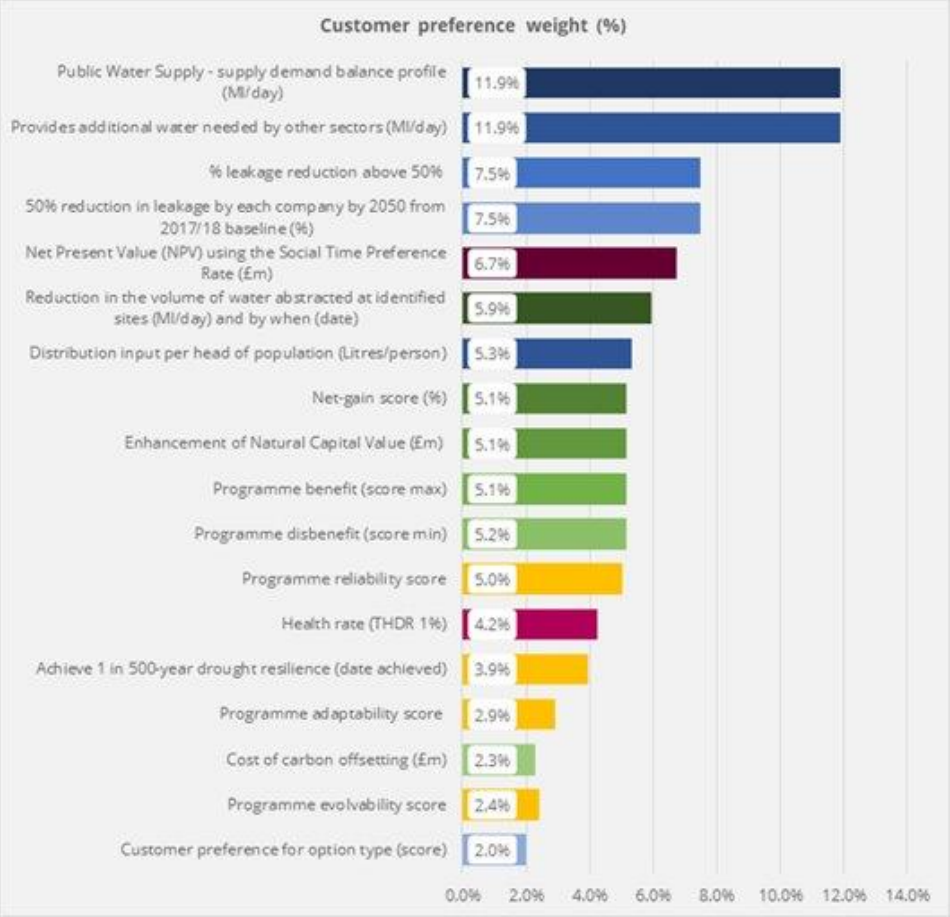


Figure 41: Customer preferences for options to improve the balance between supply and demand

As part of our collaborative regional plan engagement activity, we tested the affordability and acceptability of the regional plan with our customers. This research is detailed in our Statement of Response but also summarised in Section 3.8.

3.8 Customer research to validate regional modelling outcomes

Alongside work carried out at a regional level we completed our own validation exercise to ensure that the regional approach and outcomes are right for our customers and communities within our supply area. This research informed our decision-making process about whether to accept and fully adopt the outputs of the regional plan, or if there were areas where it would be appropriate to challenge.

3.8.1 Existing evidence

We first reviewed the existing evidence base of over 30 published reports across the sector to see what could be learnt and where different research came to similar and supporting conclusions.

Our review of existing evidence reaffirmed our understanding that the top two priorities for customers regarding their water supply are ensuring a reliable water supply and fixing leaks. When presented with more information about water resources and options to improve the balance between supply and demand, customers tell us their top three option types to achieve these are, in order of preference, reducing and fixing leaks, using less water, and increasing supply.

Existing research told us that customers support us making long term supply-demand choices that prioritise demand management over new supply options and demonstrate cost efficiency. Customers want to see sustainable long-term solutions that protect and conserve the environment and promote energy efficiency (and reduce our carbon footprint).

3.8.2 New research to inform our decision-making process

We then investigated specific topics with customers to find out more:

- Quantitative research has been carried out over two waves with our Customer Panel. This provided a larger-scale snapshot of views across our household customer base.
- Qualitative research generated more considered and informed views through a deliberative process and represented the views of a wider range of audiences including non-bill payers and non-household water users.
- 'Water Talk', our Customer Advisory Panel (CAP) discussions explored key areas in more detail and depth, such as the challenges we face. Our engagement with this group has helped to define our demand management options.

    - In March 2022, 700 Water Talk panellists took part in the first wave of engagement. In June 2022, 574 Water Talk panellists took part in a second wave of engagement.
    - The CAP[24] is designed to be an increasingly 'expert' citizen sample of Portsmouth Water's current customers and future customers. For these surveys, Portsmouth Water customers were selected to match the known demographic profile for age and gender although otherwise the Panel was self-selecting rather than purposely sampled to be representative.
    - We engaged with the Panel during the pre-consultation phase of the dWRMP24 to consider the long-term vision for WRMP24 and the PR24 Business Plan.

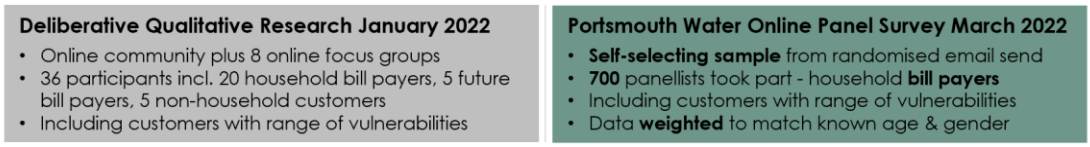


Figure 42: summary statistics of research to inform decision making

[24] Customer Advisory Panel, Report 1 Response to Portsmouth Water's long term vision (13th June 2022).

- We commissioned Community Research to undertake a survey of support organisations at the beginning of 2022 to uncover how satisfied they were with the way we manage services for vulnerable customers.

    - 70 per cent of respondents reported that they were 'satisfied' or 'very satisfied' with the services that Portsmouth Water provides to customers living in vulnerable circumstances. That said, the cost-of-living crisis is top of mind for support organisations.
    - Respondents warned that metering could be a source of anxiety for many vulnerable clients and that they could only address this anxiety, and any misinformation from other sources, if they were well informed. Respondents were keen to understand how customers in the most vulnerable circumstances would be protected against bill increases. This is helping to define our approach to delivering universal metering.
    - We presented to our Customer Scrutiny Panel who provide overview over all aspect of our engagement with customers. They were keen for us to continue to explore the acceptability to customers of using recycled water and to exchange our research with Southern Water in the development of the new Havant Thicket related options. They also asked us to specifically consider the impact of the proposed meter programme on vulnerable customers and how the metering process could enhance our support for those customers rather than be perceived by them as a potential threat.

There was an iterative process through the research, building on customer feedback. For example, some of the material presented to members of our Customer Scrutiny Panel had been refined based on feedback received from consumers in the first round of the qualitative CAP.

Looking at evidence from these differing approaches to engagement has enabled us to validate and understand a broader view of customer priorities.

For instance, although universal metering with smart meters is seen as a lower initial priority (as shown in the quantitative customer wave research results), support increases when customers are informed of the range of benefits (as evidenced in the qualitative research results).

Universal metering is broadly supported and is preferred to desalination, water recycling or water transfers. In response to detailed descriptions of local schemes, seven out of 10 respondents support universal smart metering with only 14 per cent actively against it based on concerns over water affordability and negative perceptions of smart energy meters. There's a similar level of support for water recycling at Havant Thicket Reservoir, with only 9 per cent actively against it.

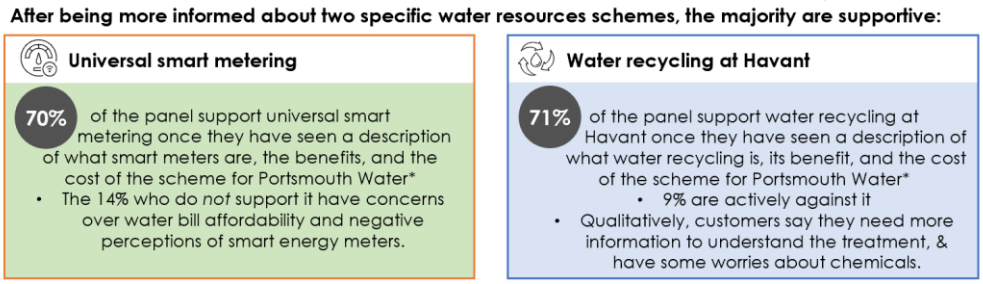


Figure 43: customer views on universal smart metering and water recycling at Havant Thicket.

Considering the longer-term picture, and after being informed about the region's water resources status, the large majority wanted to prioritise both ensuring a reliable long-term supply and avoiding damage to the local environment over keeping bills as low as possible.

Research indicates that most customers are prepared to pay more for long-term sustainable water supplies. In terms of initial response to ideas to ensure enough water in the future, nearly everyone wanted to see further investment into reducing leaks. There is also strong support for both demand management and Havant Thicket Reservoir.

3.8.3 Barometer Survey carried out alongside the public consultation of our dWRMP24

Wave 4 of 'Water Talk', our consumer panel took place between 13th and 30th January 2023. 434 Portsmouth Water bill payers who are part of the 'Water Talk' panel took part in an online multiple-choice survey. The invite is shown in Figure 44.

It is important to note that the panel is self-selecting, rather than deliberately sampled to be representative[25] of the wider customer base. This means panellists may be more engaged with the water sector and knowledgeable about Portsmouth Water than customers in general. To try to make the data from this survey as representative as possible, it was weighted to match the known demographic profile of Portsmouth Water customers (age and gender).

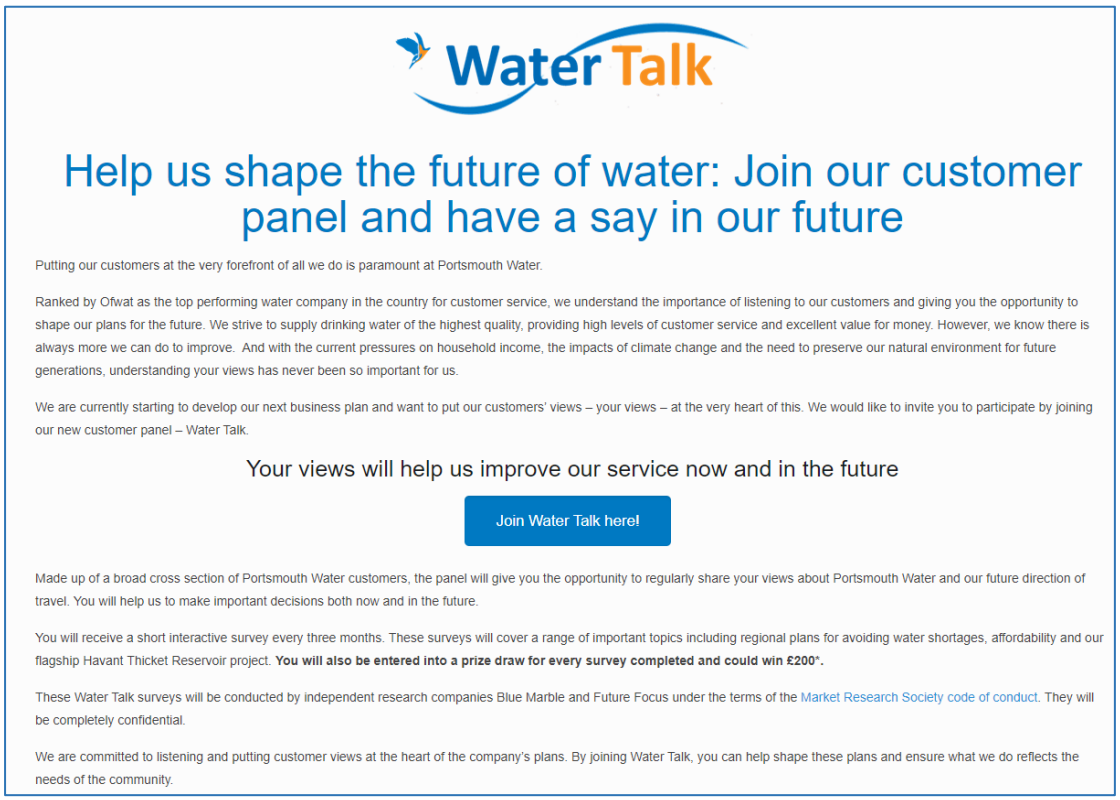


Figure 44: Invitation to Water Talk on the Portsmouth Water website

Our Barometer survey showed there is strong support for all the key elements of the plan.

[25] Water Talk | Portsmouth Water

Of the 434 customer panellists who took part in our Barometer Survey, 89% expressed support for our plan. This is shown in Figure 45. The highest level of support was from customers in the 16-44 age range (95%), followed by 65+ (87%).

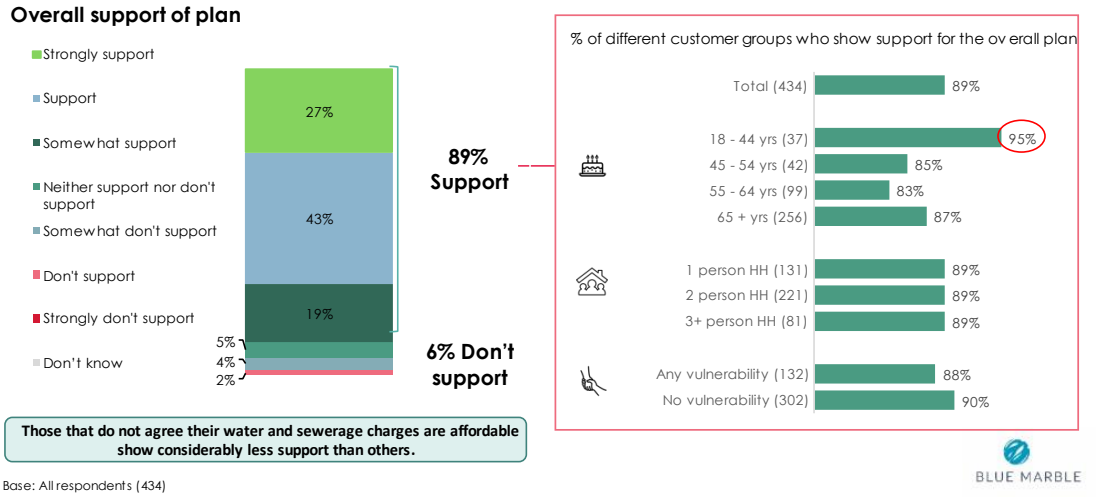


Figure 45: Overall support for the dWRMP24 from the Barometer Survey (Q9a. Overall, how much do you support this plan?)

As shown in Figure 46 of the 386 Barometer Survey respondents who supported the plan, their top reasons were that it was a sensible/logical plan and that the cost increase is reasonable.

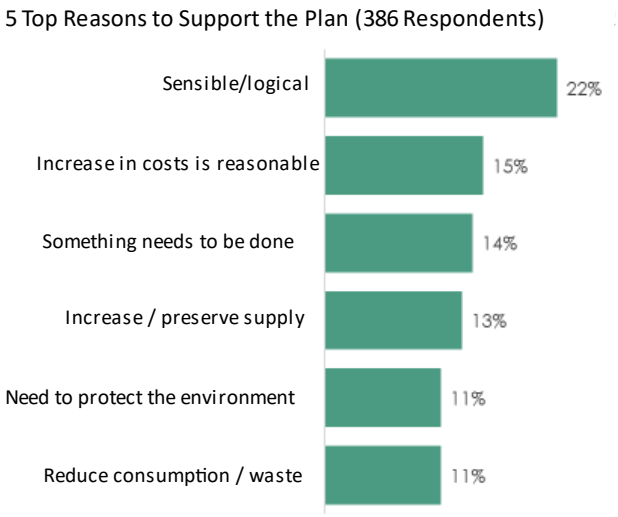


Figure 46: Top five reasons to support the plan from the Barometer Survey

Only 28 respondents did not support the plan, so the small size of the sample means that the reasons provided need to be treated with caution. Of these 28, the two most common reasons given for this were that they felt the cost increase should not be passed onto customers and that they do not support smart meters.

3.8.3.1 Barometer and Website Surveys

In addition, we asked our customers six specific questions about our proposals to reduce demand through both our Customer Panel Barometer and Website surveys. We asked the same questions in both surveys so we could reach a greater sample of customers and compare engagement methods. The Barometer and Website survey results are presented alongside one another to allow comparison between the two surveys. Both surveys demonstrate strong support for the overall balance between supply and demand.

- Over 70% of customers in both surveys told us they supported the balance between supply and demand.
- Over 85% of customers in both surveys told us that they support our plans to reduce leaks by half by 2050. Additional customer research found that customers were also supportive of reducing leakage by 50% by 2040 which formed the basis of this WRMP24.
- Over 85% of customers in both surveys told us that they support our plans to help homeowners and businesses save water.
- 70% of website survey responses, and 77% of Barometer responses told us that customers support our plans to install meters at most homes we supply to encourage water saving and find more leaks.
- Over 80% of the customers who answered each of the surveys agreed that water bills based on the amount of water a household uses would be fairer than bills based on rateable value (the estimated rent of a property).
- Over 80% of the customers who answered each of the surveys expressed their support for the use of smart meters.

This is presented in Figure 47 to Figure 52.

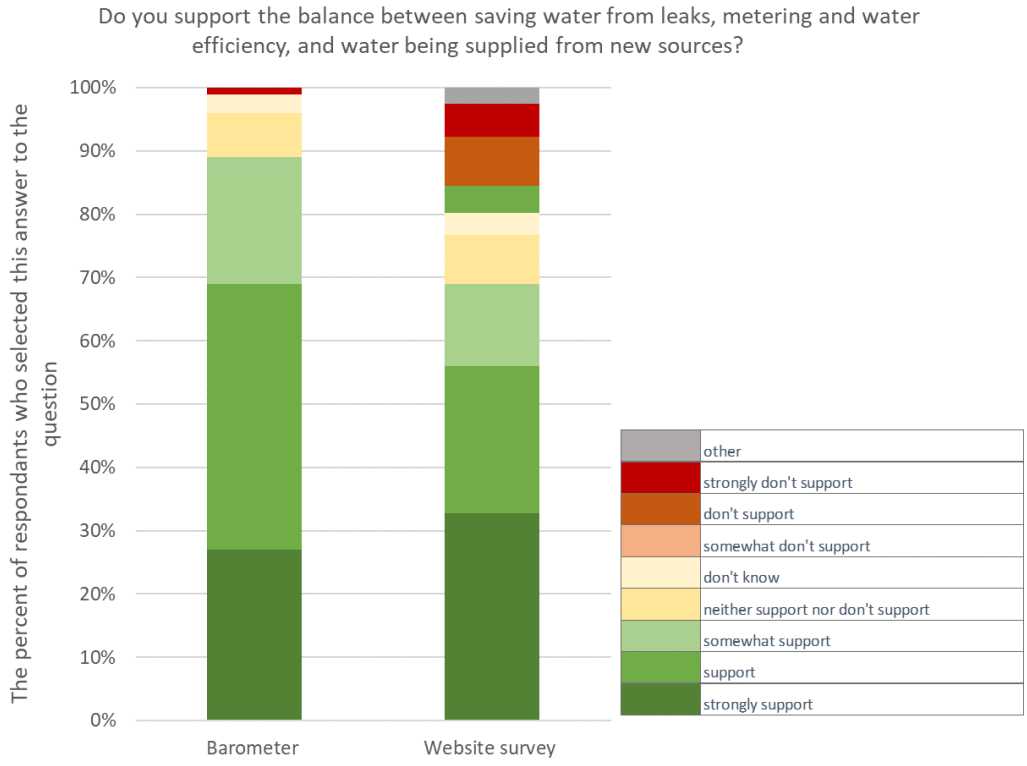


Figure 47: Barometer and Website survey results about the balance between supply and demand options

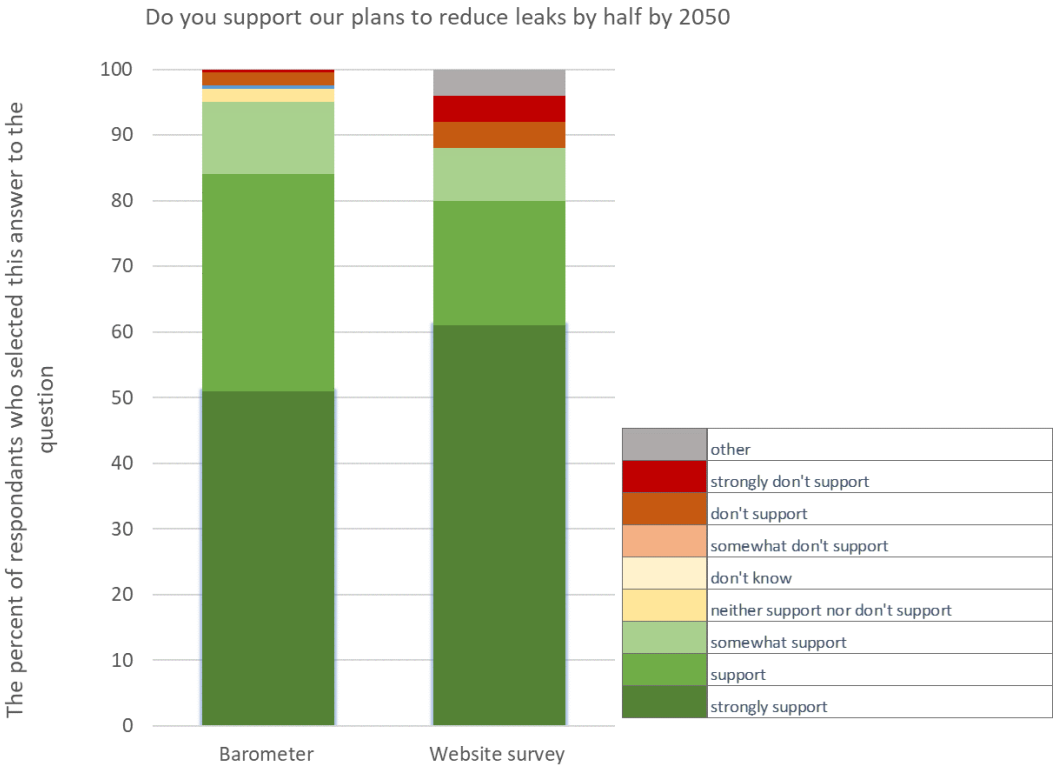


Figure 48: Barometer and Website survey results about our plans to reduce leakage in half by 2050

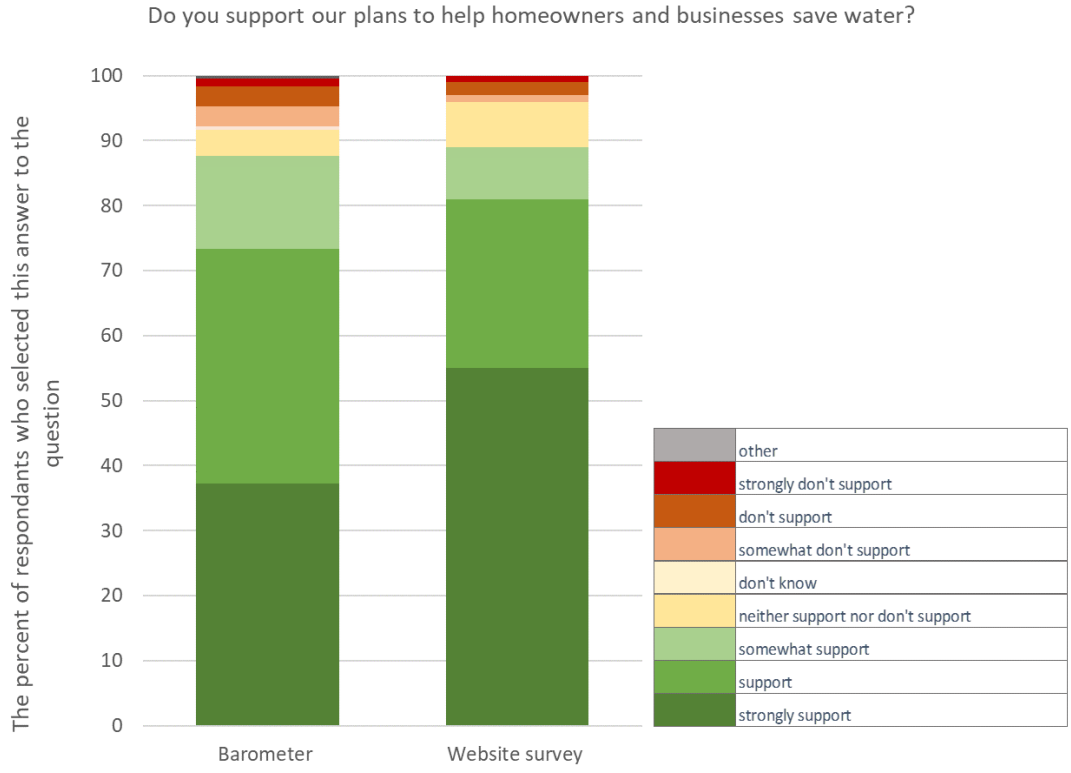


Figure 49: Barometer and Website survey results about our plans to help homeowners and businesses save water

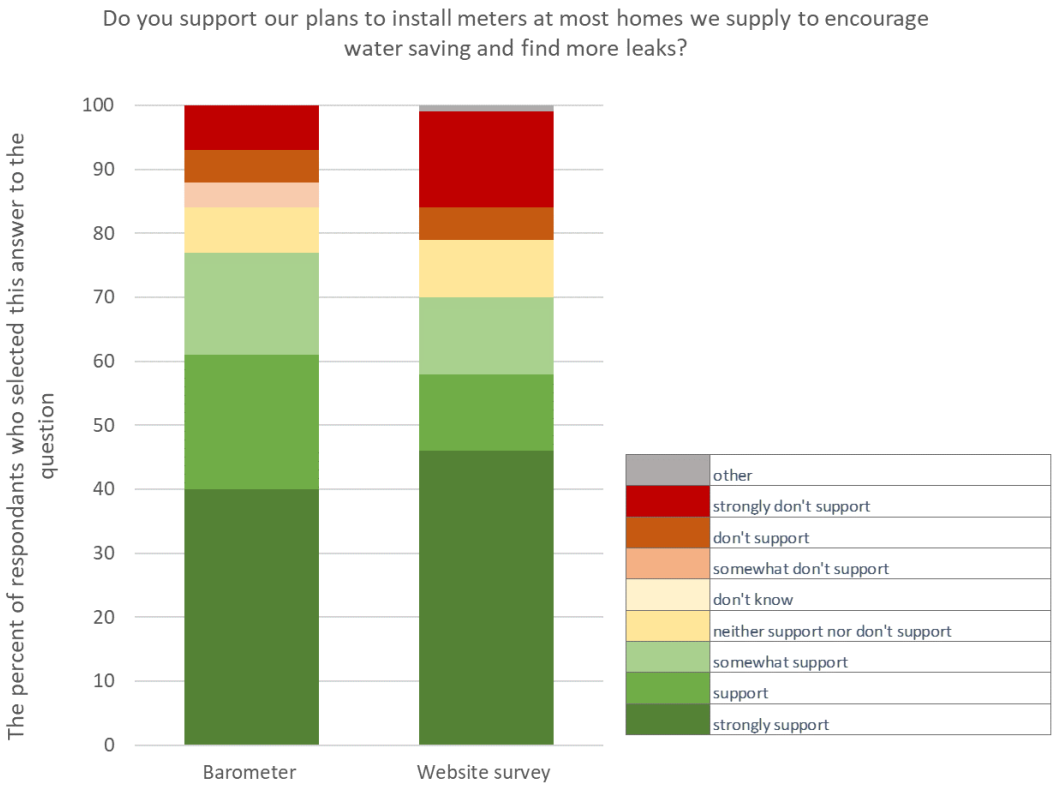


Figure 50: Barometer and Website survey results about our plans to use metering to save water and find more leaks

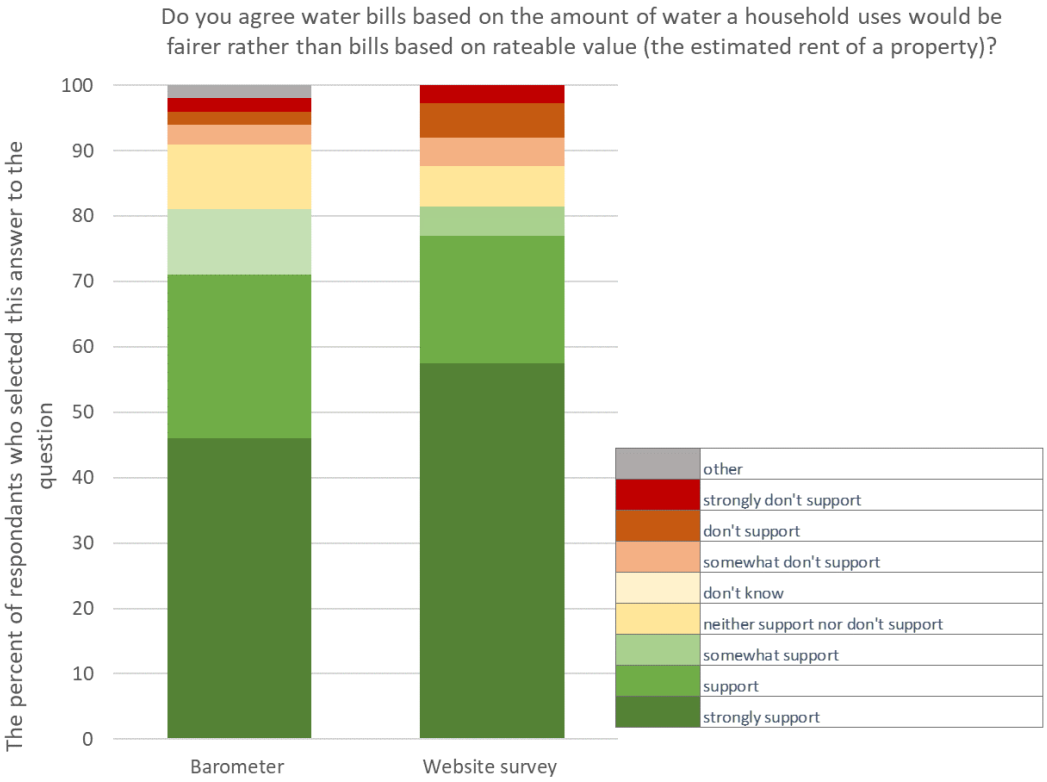


Figure 51: Barometer and Website survey results about metering being a fairer way for bill payments

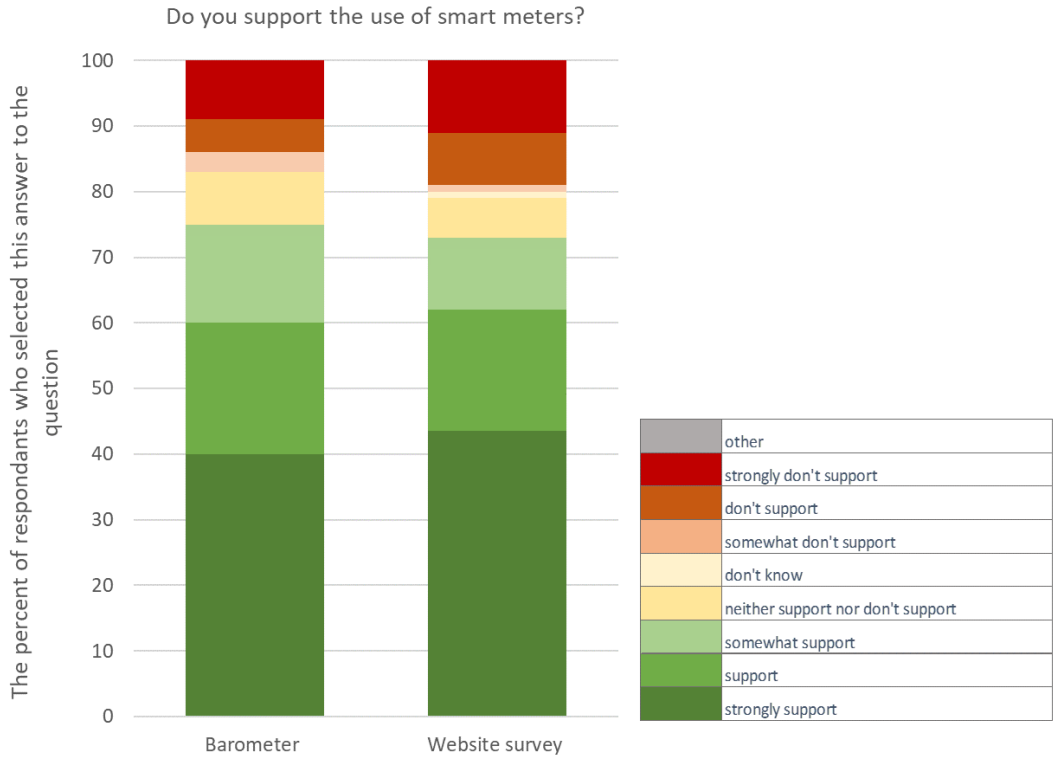


Figure 52: Barometer and Website survey results about our plans for smart metering

4 BASELINE DEMAND

4.1 Introduction

This section details our current and forecast future demand for water. It defines and explains the basis of the different demand scenarios used in water resources planning, including base year and forecast household demand, water efficiency, non-household demand and leakage. By presenting baseline demand this section is forecasting what we think will happen without options/interventions being applied. Details of what interventions we have considered and are proposing to implement, including achieving the National Framework's 110 litres per head per day (l/h/d) in a dry year target, are provided in sections 7.7.1 and 10.4.

As part of our adaptive planning approach different demand scenarios have been assessed for high, medium and low growth in population and properties and for the impact of climate change.

Appendix 4A to 4D provide further information on relevant methods used.

The demand forecast figures in this Section report our baseline in a 1-in-20 year drought event which reflects unconstrained demand at the point we would introduce Temporary Use Ban drought restrictions. This reflects our supporting WRMP Tables and the WRSE regional modelling, which also report an unconstrained baseline demand for the 1-in-20 year drought event. This is in accordance with the regulator's Water Resources Planning Guideline.

A number of components of the wider baseline demand forecast have been developed by WRSE to ensure consistent planning scenarios regionally (these have been listed as appendices where relevant). This has been detailed in Table 9. To determine the demand forecast under each of the adaptive pathways, a range of plausible estimates in housing and population forecasts, climate scenarios, water efficiencies and markets have been assessed. To understand demand under uncertain futures, all selected adaptive planning pathways have been reported against, which is a step change from only reporting a core scenario in WRMP19.

Our demand forecast has been updated since the publication of the dWRMP24. Our base year has been updated to 2021-22. This has involved updating the population and property forecasts to reflect numbers based on the 2021 Census, and our 2021-22 annual performance reporting which includes leakage and metering. Moving the base year of our demand forecast has had the impact of increasing the amount of water we assume households are using at the start of our planning period because the starting position now includes the Covid-19 post-pandemic 'new normal' of more people working from home for significant periods. Since the dWRMP24 we have produced a new supporting Appendix 10B which details our water efficiency strategy, and the longer term effects of Covid-19 on demand.

We have also changed the targets for demand during the planning period as the April 2023 WRPG specified that household per capita consumption (PCC) targets need to be achieved in dry years as well as normal years (this was incorporated in the range of demand options in Section 7).

To summarise, the WRMP24 demand forecast starts from a point of greater consumption but aims to reach a more challenging lower PCC alongside other demand-side targets (as set out in the revised WRPG and Defra's EIP) than our dWRMP24. This has provided a significant challenge.

We have worked at a regional level across the South East of England, through WRSE to review and revise the way we have included the impact of government interventions such as

a water labelling scheme. This is called the 'Gov Led C+' option and is now tested within our demand model.

In light of consultation comments, we have included additional appendices with the WRMP24, these include:

- 4B: Non household demand forecast methodology.
- 4Ca-b: Population and property forecasts and updates.
- 4D: The non household demand forecast update.

For our final WRMP24, we have also adjusted our demand forecast to avoid double counting the properties, population and forecast water demand that are reflected within NAV WRMPs.

Table 9: Summary of baseline demand forecast components, their definition, and their delivery/assurance

Component	Definition / Description
Baseline demand forecast = **Non-household forecast** + Household forecast + **Leakage Baseline** + **Climate change impacts**	A forecast of the future demand for water from households, businesses, industry and other sectors, accounting for climate change, leakage, population and property growth and minor components. Non-household demand determined from a range of other forecasts including population and properties, climate and the economy. Uses population and property forecasts and a range of other forecasts including climate to determine household demand with Per Capita Consumption (PCC) and Per Household Consumption (PHC). Used to determine demand due to leakage through distribution network losses and customer-side supply pipe leaks. Demand forecasts are modelled against varying climate scenarios and different drought severities.

Key:	Delivered by Portsmouth Water	**Assured by Portsmouth Water**	Delivered in Regional Partnership (WRSE)	**Assured in Regional Partnership (WRSE)**

4.1.1 Historic and current demand

Figure 53 shows our historic Distribution Input (DI) from 1995–96 to 2021–22. There has been a steady long-term decline in DI since 1995–96. This is attributable to a combination of leakage management, declining non-household demand and greater household water efficiency. Since 2010, there has been a steady fall in DI from 181 Ml/d to a minimum of 167 Ml/d in 2015–16. This decline is attributed to a fall in commercial demand of 7 Ml/d since 2010, in addition to increased active leakage control, pressure management and improvements in household water efficiency. Since 2016-17, DI has overall been increasing, peaking in 2020-21 during the Covid-19 pandemic, before declining to 177 Ml/d in 2021–22 (the base year for the rdWRMP24).

2021–22, has been chosen as the base year for the WRMP24 to provide the most up-to-date view of demand possible (at the time of the demand forecast). Moreover, 2021-22 has been selected as the base year since 2020–21 was impacted by both Covid-19 and a hot dry summer.

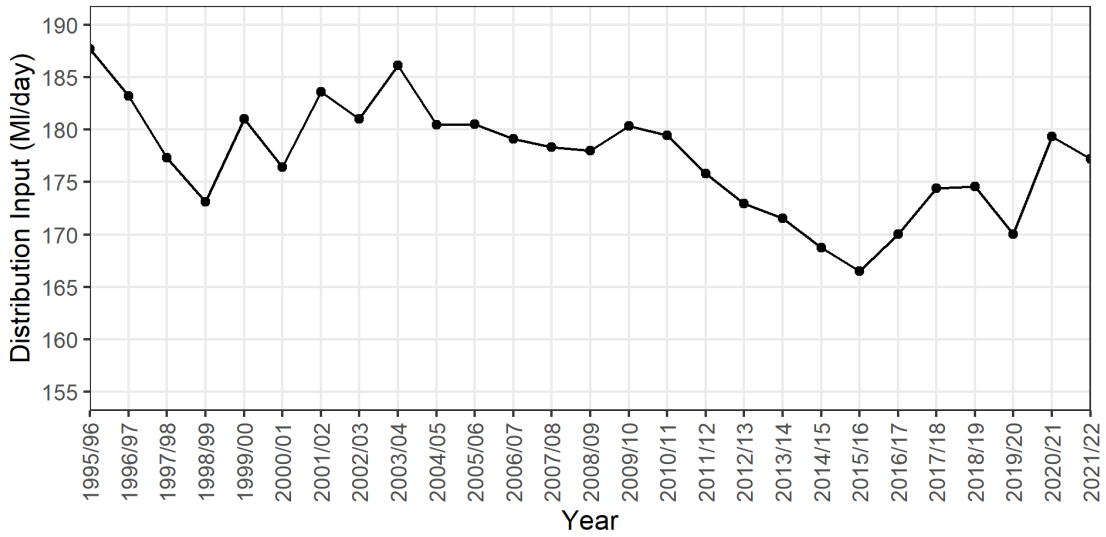


Figure 53: Historic annual average distribution input (Ml/d).

4.1.2 Demand scenarios

The WRPG requires demand forecasts to be produced for the three planning scenarios defined below:

- *Normal Year Annual Average Demand (NYAA):* The annual average daily value of demand under 'normal' weather conditions. The base year must be assessed as to whether it is a normal year, and if it is found not to be, its demand must be normalised to take account of factors such as weather.
- *Dry Year Annual Average Demand (DYAA):* The annual average value of demand under dry conditions without any drought demand restrictions in place. This demand is presented against the Average Demand Deployable Output (ADO) supply forecast.
- *Dry Year Critical Period Demand (DYCP):* The rolling 7-day average peak week that occurs during the dry year. This demand scenario is presented against the Peak Deployable Output (PDO) supply forecast.

The Normal Year Critical Period (NYCP), the 7-day average peak week that occurs during 'normal' weather conditions has also been reported for completeness. The agreed Portsmouth Water Dry Year definition is that "dry year" scenarios are classed as 1-in-20 year events.

The method by which demands for these different scenarios have been derived is set out in section 4.2 below.

4.2 The base year

4.2.1 Normalisation of distribution input

The level of demand for water is not fully controlled by factors under the influence of a water company. Whilst demand does vary year to year because of ongoing trends, leakage reduction, water efficiency, metering and changes to properties and population, it is also dominated by the weather, with hot dry weather causing the demand for water to rise significantly.

Demand normalisation seeks to separate the effects of our ongoing interventions on leakage from the effects of weather, so that an estimate can be made of the demand that would have occurred in the base year had 'normal' or 'dry' conditions been experienced.

In order to achieve this, a weather demand model (Dynamic Demand Modelling for WRSE, WRc, 2020), consistent with *WRMP19 Methods – Household Consumption Forecasting* (UKWIR, 2016) guidance, was developed. It allows historical and stochastically generated weather data to be run through the base year to determine how base year demand (both annual average and critical period) would change if the weather in year 'X' occurred again in 2021-22.

Historical data is used to produce an estimate of the normal year, which is well understood, as this type of year occurs most frequently. To get a best view of NYAA and NYCP demand in 2021–22, DI was de-trended using a Seasonal and Trend Loss decomposition. The data was then annualised and ranked, and the 50th percentile used to represent the Normal Year. Figure 54 shows the normalised result from the weather demand model. The blue line represents historic outturn DI, whilst the orange line represents the normalised DI data simulated by the regression model. The simulated DI data provides an estimate of what DI would be if that year's weather happened again with the current customer base and behaviours.

The stochastic DI data is then used to explore rarer events, which are limited in the historic 20 year record. Raw simulated DI is first normalised to the median DI across all years and stochastic runs converted to factors. These factors can then be used as multipliers to the already derived NYAA and NYCP to generate DI annual averages (AA) and annual weekly maximums (CP) for different return periods, including the 1-in-20 year DYAA and DYCP. Further information is presented within Appendix 4A.

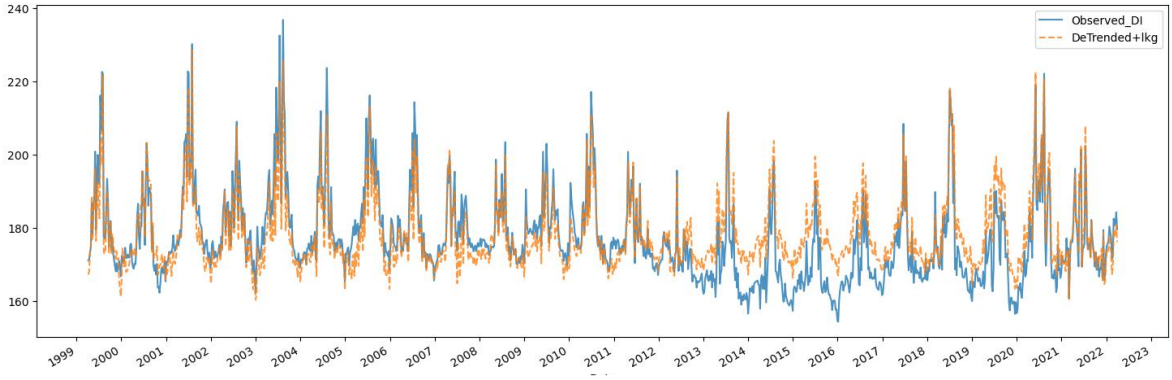


Figure 54 Normalised (simulated) distribution input time series

4.2.2 Base year population, property and occupancy

4.2.2.1 Base year household population

Population and property numbers for the WRMP24 were provided by Edge Analytics as part of regional forecasting with WRSE (Edge Analytics, June 2023), which ensured consistency across the region. Appendix 4Ca and 4Cb provide further information. Table 10 indicates that there has been a 0.25 per cent increase in the company's household population since

WRMP19 (2019–20[26]). For rdWRMP24, the base year (2021–22) household population is 732,860, comprised of 220,910 measured and 511,950 unmeasured households.

Table 10 WRMP19/WRMP24 Base Year Household Population Estimate Comparison

	WRMP19 (2019-20)	WRMP24 (2021-22)	Difference
Total Household Population	731,052	732,860	+1,808

4.2.2.2 *Base year household properties*

The base year number of household properties is taken from our billing system. For the WRMP24, the total number of household properties in the base year (2021-22) is 300,730 (Table 11).

Table 11 Base Year Household Properties

	Measured	Unmeasured	Total
2021–22 Total Household Properties (Excluding voids)[27]	102,220	198,510	300,730

4.2.2.3 *Base year household occupancy*

Household occupancy is calculated using the Edge Analytics 2021-22 population estimate divided by the number of properties in the company billing system for measured and unmeasured classifications (Table 12). The company average occupancy in the base year (2021-22) is 2.44 persons per property.

Table 12 Aggregated 2021-22 Occupancy by Measured/Unmeasured Status

	Measured	Unmeasured	Company Average
2021-22 Household Occupancy (Excluding voids)	2.16	2.58	2.44

[26] The initial base year for WRMP19 was 2017-18, however this was updated to 2019-20 with the Revised WRMP19 (Dec 20202) update.

[27] Void properties have been calculated in accordance with the Regulatory Accounting Guidelines as per the Annual Performance review for the base year. The number is the average number of residential properties within the Portsmouth Water supply area which are connected to the company's assets but do not receive a charge as there are no occupants. This is based on billing records held by the company based. The forecast number of voids remains consistent over the planning period.

4.2.2.4 *Base year non-household population*

Non-household/communal population refers to residential accommodation such as sheltered accommodation units, student halls of residence, large hostels, hospitals and prisons. Table 13 summarises non-household population estimates for the year 2021-22 for comparison with WRMP19. Comparison between the WRMP19 figures and the revised Edge Analytics WRMP24 estimate indicates there is a marginal difference (+0.21 per cent overall). For the WRMP24, the base year (2021-22) non-household population is 14,170.

Table 13 WRMP19/WRMP24 Base Year Non-Household Population Estimate Comparison

	WRMP19 (2019-20)	WRMP24 (2021-22)	Difference
Measured Non-Household Population	12,606	12,600	-6 (-0.05%)
Unmeasured Non-Household Population	1,534	1,570	+34(+2.29%)
Total Non-Household Population	14,140	14,170	+30 (+0.21%)

4.2.2.5 *Base year non-household properties*

Prior to the final WRMP19, historical non-household property data was cleansed to align our billing system with the Ofwat guidance on eligibility for the opening of the non-household retail market. Figure 55 shows the trend in measured and unmeasured non-household properties since 2010. There has been a steady decline in the number of measured non-household properties. The drop in measured properties in 2013–14 is a result of a change in our billing system when significant data cleansing occurred. Both groups show a further a drop in measured properties in 2019–20. The drop is attributed to both allocation of properties to the retail market but also the effect of Covid-19.

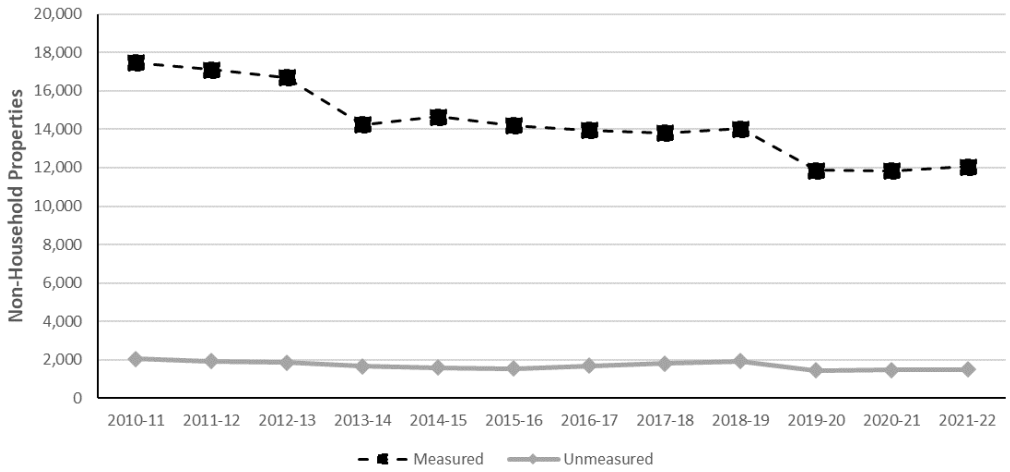


Figure 55 Historic Outturn Non-Household Properties

4.2.3 Base year per capita consumption (PCC)

One of the important components of household demand is per capita consumption (PCC). Understanding customer usage is crucial to designing demand management options that may

help customers save water and help to reduce any supply-demand deficit (feasible customer options are discussed in the options appraisal, Chapter 7).

Firstly, base year PCC must be estimated for both unmeasured and measured customers. We use a water balance approach to estimate outturn unmeasured PCC, while outturn measured PCC is more readily calculable from meter readings.

Figure 56 displays the trends in unmeasured and measured PCC, with the values being reported in Table 14. Unmeasured PCC showed a steady decrease since 2009–10 through to 2016–17, although it has increased again over more recent years. Measured PCC has fluctuated between 112 l/h/d (in 2013–14) and 149.2 l/h/d (in 2020–21). It should be noted that these values are not the historically reported PCCs for previous years, but revised PCCs which take account of the change in the water balance because of the Consistency of Reporting Performance Measures (UKWIR, 2017) industry wide leakage convergence project.

To calculate the base year PCCs for the scenarios required by the WRPG, a water balance approach is again taken. The normalised DI produced by the weather-demand model is balanced with the bottom-up regression model of the sub-components of DI. The outputs of the model provide a good balance with an error of just one per cent.

Measured and unmeasured PCC values are broken down into their constituent micro-components for illustrative purposes. PCC has been apportioned into the different micro-components based on the Water Research Centre (WRc) Compendium of Micro-Components (WRc, 2012). The apportionment for all scenarios is shown in Figure 57. Personal washing and toilet flushing accounts for the greatest proportions of PCC. All components exhibit higher values in a critical period relative to the annual average, and for a dry year relative to the annual average, although external use exhibits the greatest proportional increase relative to NYAA under both average and critical period conditions.

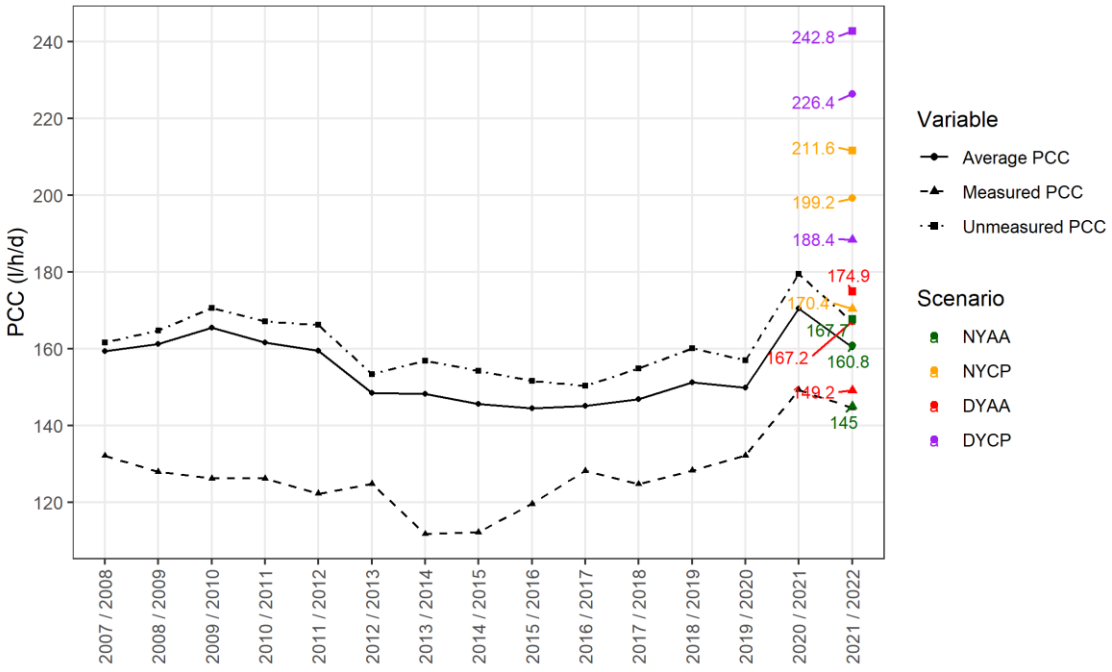


Figure 56 Per Capita Consumption (PCC) graph (DY = 1-in-20 year)

Table 14 Per Capita Consumption (PCC) (l/h/d) (blank cells reflect non base years)

	2009–10	2010–11	2011–12	2012–13	2013–14	2014–15	2015–16	2016–17	2017–18	2018–19	2019–20	2020-21	2021-22
Outturn Measured	126	126	122	125	112	112	120	128	125	128	132	149	145
Outturn Unmeasured	171	167	166	153	157	154	152	150	155	160	157	179	167
NYAA measured													145
NYAA unmeasured													168
DYAA measured*													149
DYAA unmeasured*													175
DYCP measured*													188
DYCP unmeasured*													243
* DY = 1-in-20 year													

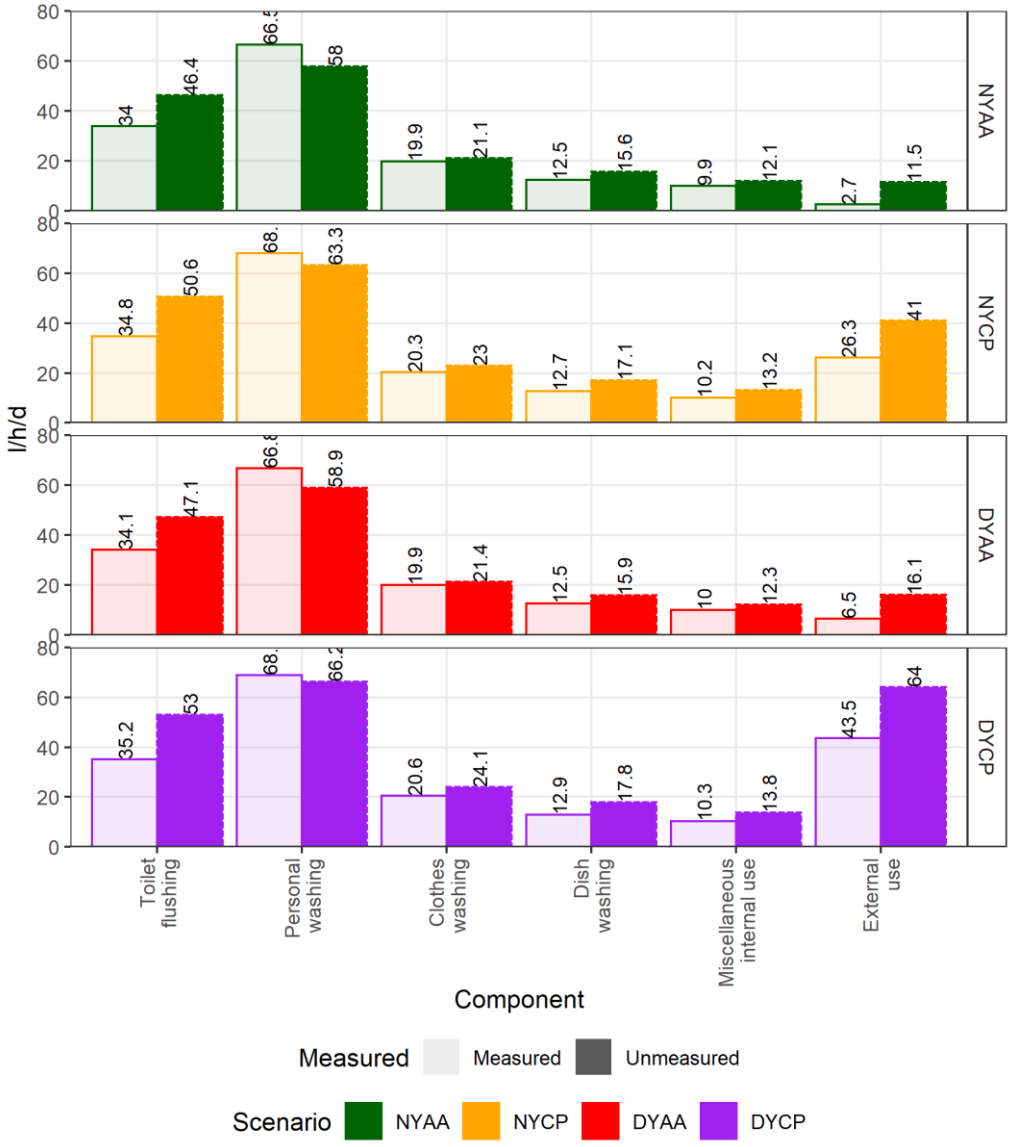


Figure 57 Breakdown of Base Year Per Capita Consumption (PCC) by micro-component (DY = 1-in-20)

4.3 Baseline household demand forecast

The baseline household demand forecast projects future customer water consumption based upon household property and population forecasts with PCC and Per Household Consumption (PHC) forecasts and climate impact projections to determine household demand. The baseline forecasts consider the impact of the baseline metering policy and water efficiency activity we undertake but indicate customer consumption without any further intervention beyond the base period (2020–2025) and do not include the impacts from any drought measures.

We are supportive of the aims of Water Neutrality to improve building standards and reduce our demand for water. However, we acknowledge Water Neutrality cannot solely be delivered by the water companies who cannot be seen as the "default" funders of the measures required for water neutrality. The delivery of water neutrality must be on the basis of concerted action in partnership with the local community, and involving the local authority, local water companies, the Environment Agency and developers. Due to the above considerations, demand savings from Water Neutrality have not been included in the WRMP24 (as baseline demand or as options), however we will continue to liaise with the relevant authorities to support its implementation.

4.3.1 Household property and population forecast

Uncertainty within the predictions of future economic and demographic futures presents a challenge for water resource management. Thus, robust evidence on future housing growth and demographic change is a key component of the WRPG. Population and property numbers for WRMP24 were provided by Edge Analytics, June 2023 (see Appendix 4Ca and 4Cb for further information) as part of regional forecasting for WRSE, which ensured consistency across the region.

For WRMP24 Edge Analytics produced a range of scenarios, for the 2023–2050 WRMP plan-period and the long-term 2050–2075 outlook (data was refreshed in February 2023). Each scenario has a growth trajectory for 2023–2050, coupled with three alternative growth scenarios for 2050–2075. The range of outcomes is necessary to enable consideration of the uncertainty associated with the demographic components of population change, the effects of different scales and phasing of future housing growth, plus the impact of alternative data inputs and assumptions applied by ONS and GLA.

The 2023–2050 scenarios can be broadly classified into three groups: trend projections; housing-led forecasts; and employment-led forecasts. Growth scenarios for 2050–2075 are underpinned by fertility, mortality and migration assumptions from the ONS 2018-based National Population Projection (NPP), configuring a principal, low and high growth outcome. All scenarios produce statistics on population, households, population not-in-households and properties and occupancy.

WRSE have selected scenarios to be applied in an adaptive planning approach (see Section 2) to represent low, high and central population and property projections (ONS18 also provides a lower central scenario and Oxcam1a provides a higher central scenario; see Table 15). Figure 58, Figure 59, Figure 60 and Figure 61 show the baseline forecasted number of new household properties, total number of household properties, household population and household occupancy figures for this WRMP24 for all housing scenarios.

New properties per year are projected to decline across the period 2023 to 2050 in all scenarios, with two scenarios forecasting higher than historical averages and two scenarios forecasting lower than historical averages. Forecasts then indicate new properties to stabilise from 2050 to 2075, although significant differences between scenarios remain. Only the 'Max' scenario maintains new property development at a rate higher than current day under the longer term forecast out to 2075. Subsequently, total new houses by 2075 range

between 52 thousand and 141 thousand across the scenarios. Figure 58 and Table 16 summarises average new properties per year under each scenario.

Population is set to increase by between 4.9% and 33.1 per cent by 2075 compared to the base year (Table 17). New housing is expected to outstrip new population growth in the region resulting in occupancy rates falling from 2.45 in 2021-22 to 2.19–2.22 by 2075 (Table 18).

Table 15. High (red), low (green) and central (yellow) population and property growth scenario components of adaptive planning situations.

Stage1: 2025–26 to 2034–35	Stage 2: 2035–36 to 2039–40	Stage 3: 2040–41 to 2074–75	Pathway / Situation	
hplan	Oxcam1a*	hmax	1	More challenging future ↑
		Oxcam1a*	2	
		Oxcam1a*	3	
	hplan	hplan	**4**	
		hplan	5	
		hplan	6	
	ONS18	ONS18	7	↓ Less challenging future
		ONS18	8	
		hmin10	9	

Pathway / Situation 4 is regarded as the reported pathway for this rdWRMP24. See Chapter 2 for further information on adaptive planning situations and Edge Analytics, June 2023 for the population and property projections. *Due to insignificant differences between Oxcam1 and hplan, hplan is used for central and higher central scenarios.

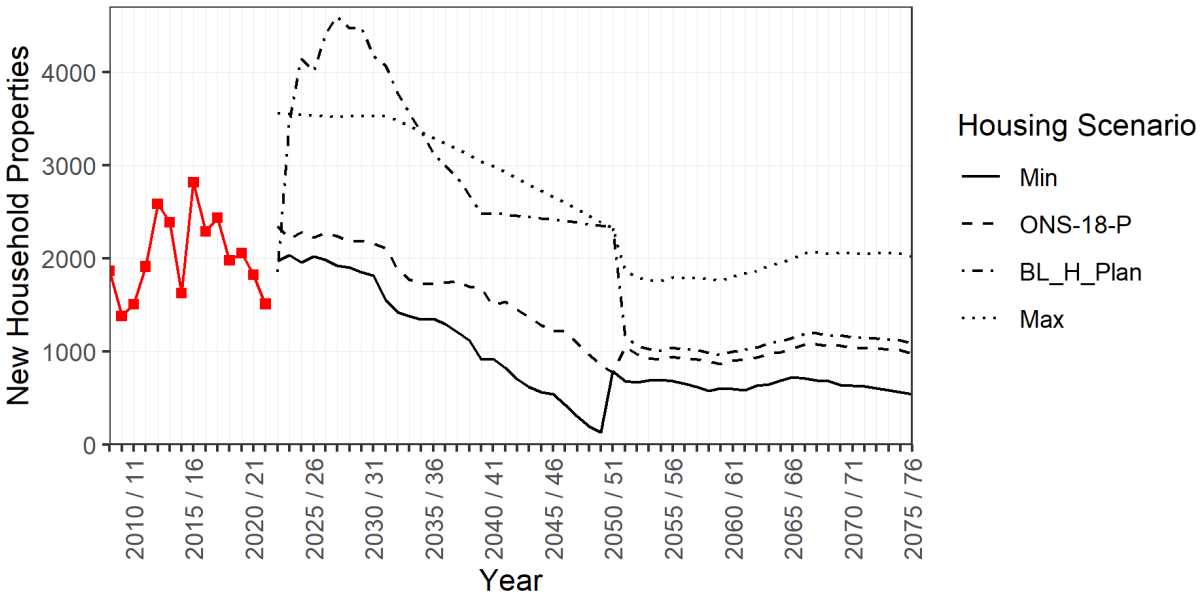


Figure 58. New Household Properties (new connections)

Table 16 New property forecasts (average per year per scenario)

	Outturn	Min	ONS-18-P	BL_H_Plan	Max
2008–2021 Historic Average New Properties Per Year	1,761				
2022–2050 Average New Properties Per Year (projections driven by trend/ housing)		1,195	1,684	3,076	3,090
2051–2075 Average New Properties Per Year (projections driven by ONS-18 fertility, mortality and migration assumptions)		682	1,025	1,134	1,986
2022–2075 Average Per Year		879	1,279	1,881	2,411
2021–22 Base Year Number of Properties	300,727				
Total New Properties by 2050		35,850	50,506	92,278	92,711
Total New Properties by 2075		51,821	75,064	119,414	140,661
Property Increase by 2075 (%) compared to 2021-22 base year		17.2%	25.0%	39.7%	46.8%

Table 17 Population forecast per scenario

	Outturn	Min	ONS-18	BL_H_Plan	Max
2021-22 Base Year Household Population	737,253				
2075 Projected Household Population		773,114	828,699	934,954	981,426
Population Increase by 2075 (%) compared to 2021-22 base year		4.9%	12.4%	26.8%	33.1%

Table 18 Occupancy forecast per scenario

	Outturn	Min	ONS-18	BL_H_Plan	Max
2021-22 Base Year Household Occupancy	2.45				
2075 Projected Household Occupancy		2.19	2.21	2.23	2.22
Occupancy Decrease by 2075 (%) compared to 2021-22 base year		-10.6%	-9.8%	-9.0%	-9.4%

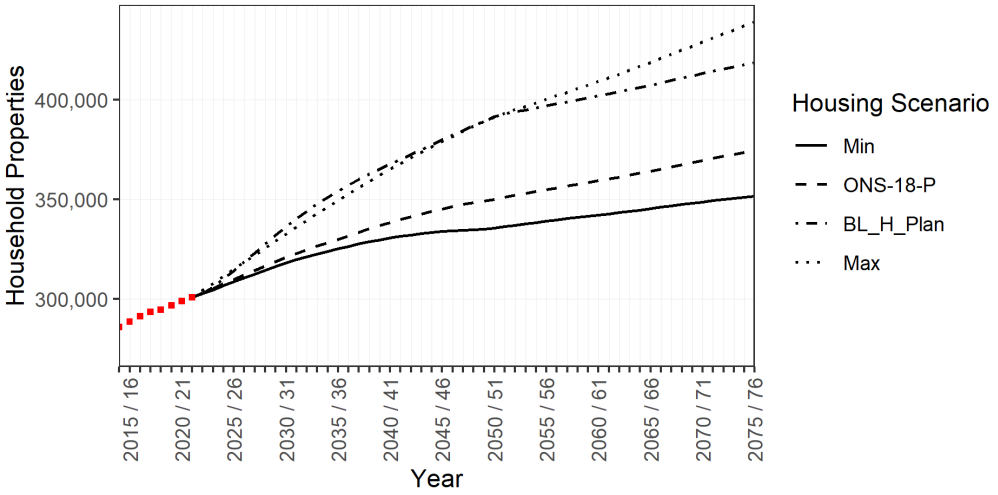


Figure 59. Baseline Household Property Forecast

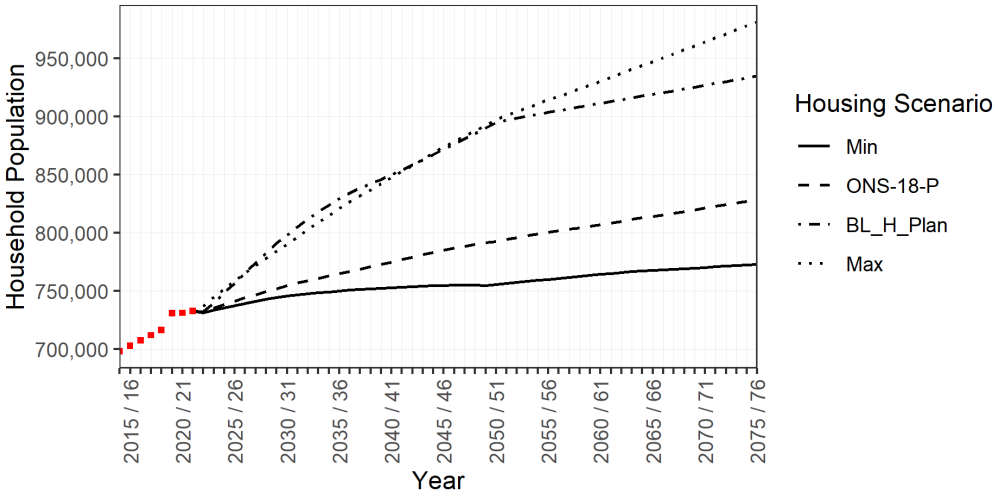


Figure 60. Baseline Household Population Forecast.

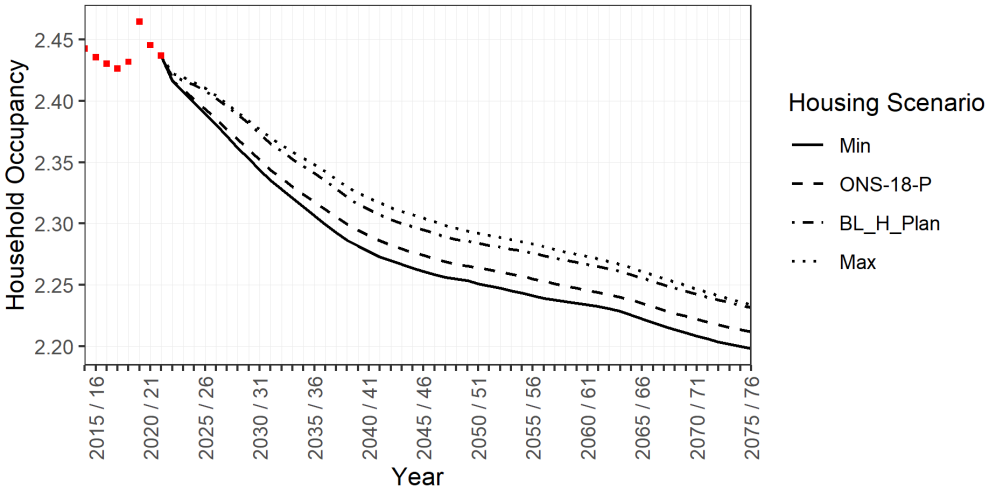


Figure 61. Baseline Household Occupancy Forecast

4.3.2 Baseline metering policy

Our current metering programme contains two elements; an optional metering element where unmeasured customers are encouraged to switch to a meter using promotional activities, and a change of occupier metering element where we install a meter at suitable properties when we are notified of an occupancy change.

In the early years of the current plan period, these programmes were hampered by access restrictions arising from Covid-19 and the need to adhere to social distancing rules to protect our customers. Over 2021–22 the number of metered properties on our network rose by 2,255. However, in 2022–23 a metering recovery programme was initiated with a trajectory to install 30,000 meters by the end of AMP7. Further information can be found in our WRMP19 2022-23 Annual Review[28] and WRMP19 2023-24 Annual Review[29].

For this WRMP24, our baseline assumption is that optant levels remain consistent with recent levels (Figure 62).

In light of our new designation as an area of serious water stress, we are able to propose universal metering as a demand management option to allow us to manage the water balance (Section 7).

Our WRSE investment modelling results indicated that universal metering is a cost efficient way of reducing demand and therefore we are proposing it as an option to be delivered in our WRMP24 (section 8 and 10).

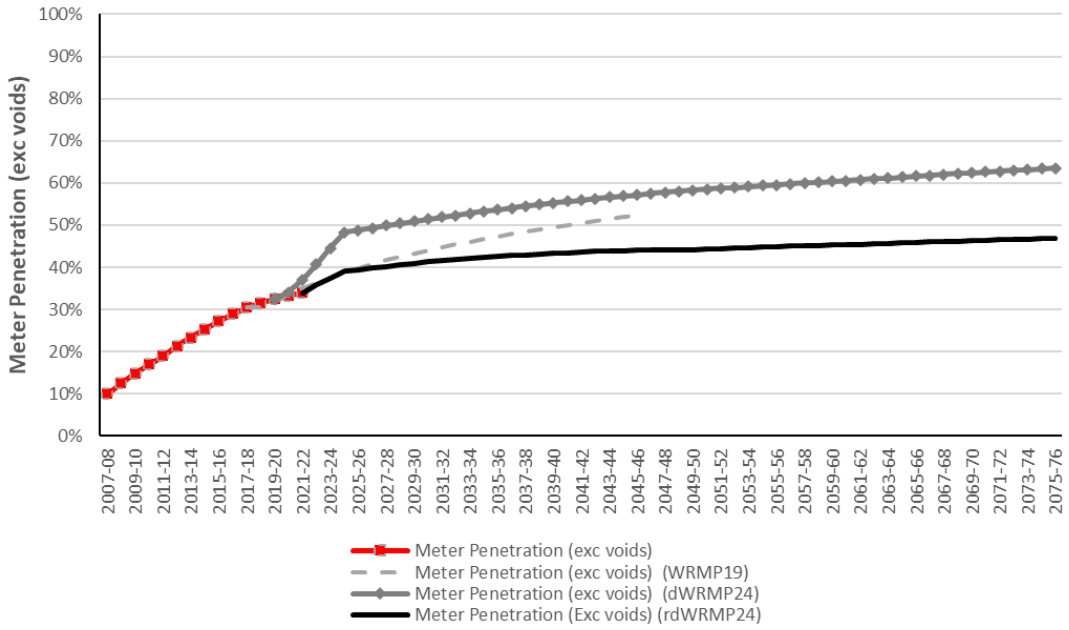


Figure 62. Baseline Meter Penetration Forecast.

Table 19 presents the percentage of household metering for WRSE companies as per their annual WRMP review.

[28] https://www.portsmouthwater.co.uk/wp-content/uploads/2023/07/Portsmouth-Water-WRMP-Annual-Review_June-2023.pdf
[29] https://www.portsmouthwater.co.uk/wp-content/uploads/2024/07/Portsmouth-Water-WRMP-Annual-Review-2024.pdf

Unlike other water companies in the South East, we did not meet the regulatory water-stressed requirements until 2021. As a result, this plan (WRMP24) is the first opportunity to propose a universal metering programme.

Table 19: Metering penetration figures across the South East region

Company	Percentage metering as of 2021	Water stressed status in 2013	Water stressed status in 2019	Water stressed status in 2022
Affinity Water*	**59.2%***	**Yes**	**Yes**	**Yes**
Portsmouth Water	**32.5%**	**No**	**No**	**Yes**
Southern Water	**87.4%**	**Yes**	**Yes**	**Yes**
South East Water	**90.0%**	**Yes**	**Yes**	**Yes**
Sutton and Surrey Water	**61.8%**	**Yes**	**Yes**	**Yes**
Thames Water	**52.0%**	**Yes**	**Yes**	**Yes**

*2020 figure used for Affinity

4.3.3 Per household consumption (PHC) /per capita consumption (PCC) Forecast

The WRMP24 has used a 'Variable Flow' (VF) method proposed in the 'WRMP19 Methods – Household Consumption Forecasting' guidance. This was a new approach developed for the final WRMP19. The VF method involves explicit exploration of the factors impacting demand and the uncertainty surrounding the model assumptions. The variable flow method uses historical data to define variables, but also requires expert judgement and the application of assumptions. The term 'variable flow' refers to how factors modify fixed future assumptions on 'flows' of water into supply. For this WRMP24, the method has been applied again with updated assumptions.

The core drivers of volume in the VF model are population, properties and climate change. The model also includes impacts for baseline options implemented for metering, leakage and water efficiency for the period leading up to 2024–25. These are consistent with the medium scenario provided as part of regional planning for the WRSE options submission.

The household demand splits the household customer base into three groups: unmeasured properties, new properties and meter optants. New properties are those customers with properties built after 2004 while meter optants are properties that have historically opted for a meter. Typically, in water resource planning, new volumes associated with growth are assigned to either new properties or new persons. One weakness of this approach is that it does not fully recognise the impact of occupancy on consumption, i.e. if average occupancy increases, then homes become more efficient and vice versa. The VF model attempts to capture occupancy impacts by assigning volumes to both properties and persons. Customer movements can then drive volume factors according to the outputs of the properties and population model. To derive the volume factors, a linear regression model was developed using company-specific data. The model uses customer type and occupancy to predict PHC

volumes. This result in coefficients that split the PHC volume impacts for persons and households (Table 20).

Table 20 Aggregated coefficients for population and property movements.

Population & Property group	Properties (l/hh/d)	Population (l/h/d)	PHC (l/hh/d) Formula
New Property	91.2	72.4	PHC = (average occupancy × 72.4) + 91.2
Measured (Meter Optant)	N/A	85.9	PHC = average occupancy × 85.9
Unmeasured	N/A	94.4	PHC =average occupancy × 94.4

The impact of climate change in our model is based on the outputs of the UKWIR 'Impact of Climate Change on Water Demand Project' (2013, Appendix 6 look-up factors). We have used the factors used for the South East derived from the 'Thames' outputs. The factors cover a range of scenarios from 10th to 90th percentile, with 50th percentile used as the central scenario. The Excel ETS forecast function has been used to extrapolate factors beyond 2040. The factors also use a 2012 base; to adjust to the rdWRMP24 base, the net difference is taken from 2021-22 onwards. The factors applied differ according to the planning scenario (i.e., Annual Average and Critical Period). To convert the factors to Ml/d impacts, the factors are multiplied by the base year total household consumption, which also varies according to the relevant planning scenario. The total Ml/d impact of climate change in each year is then split between the unmeasured and measured groups proportionally, according to the split of households for a given year.

A reduction in PHC is expected without company intervention, driven by the natural replacement of old, less efficient, water-using devices. However, in practice, we have seen a continual increase in PHC in recent years, which may suggest that natural water efficiency through device replacement is being offset by other factors, for example, changes in customer behaviour. As these impacts cannot be robustly estimated, no reduction for natural water efficiency is assumed for the central scenario.

The change in the key components of total household consumption over the planning period resulting from this forecasting exercise are shown in Figure 63. The impact of new properties and population has the greatest influence on baseline demand; however, the proportion of impact varies significantly between housing scenarios, ranging from 2.5–23 Ml/d additional demand for population and 4.6 – 16.2 Ml/d additional demand for properties by 2075 (Table 21).

The impact of climate change also acts to increase demand, but to a far lesser extent, except for the 'Min' housing scenarios under critical periods. Some reductions in baseline demand are observed over time resulting from our current meter optant policy and more significantly from the assumed increase in company-led installation of water efficient devices.

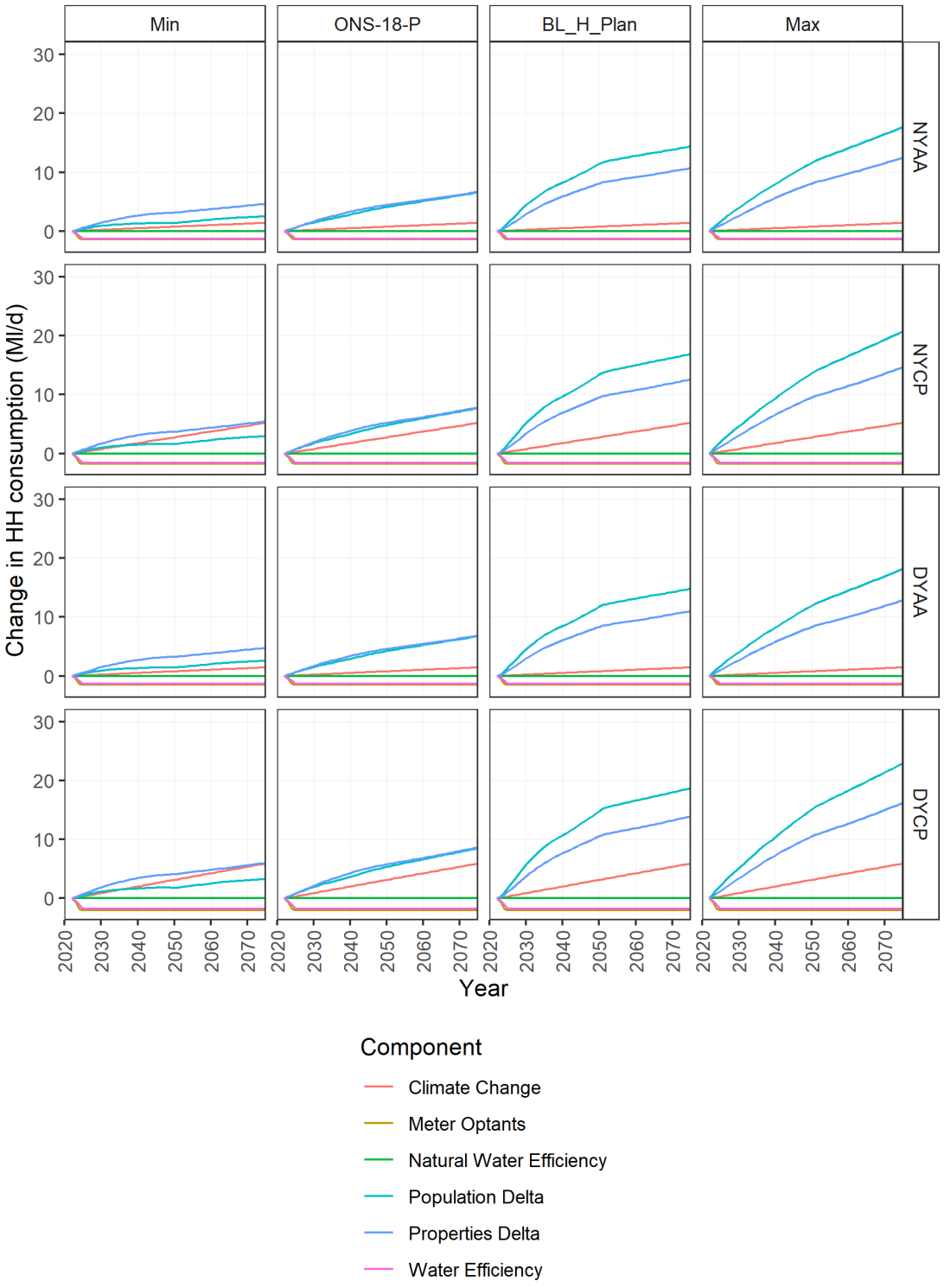


Figure 63: Cumulative change in total household consumption (DY = 1-in-20 year)

Table 21 Cumulative change in total household consumption by 2075 relative to base year (Ml/d)

Climate Scenario	Housing Scenario	Climate Change	Meter Optants	Natural Water Efficiency	Population Delta	Properties Delta	Water Efficiency (Company led)	Total Impact
NYAA	Min	1.4	-1.4	0.0	2.5	4.6	-1.3	5.8
	ONS-18-P	1.4	-1.4	0.0	6.6	6.7	-1.3	12.0
	BL_H_Plan	1.4	-1.4	0.0	14.4	10.7	-1.3	23.8
	Max	1.4	-1.4	0.0	17.7	12.5	-1.3	28.9
NYCP	Min	5.2	-1.8	0.0	3.0	5.4	-1.6	10.3
	ONS-18-P	5.2	-1.8	0.0	7.7	7.8	-1.6	17.4
	BL_H_Plan	5.2	-1.8	0.0	16.9	12.6	-1.6	31.4
	Max	5.2	-1.8	0.0	20.8	14.7	-1.6	37.3
DYAA (1-in-20)	Min	1.5	-1.5	0.0	2.6	4.7	-1.3	6.0
	ONS-18-P	1.5	-1.5	0.0	6.8	6.9	-1.3	12.3
	BL_H_Plan	1.5	-1.5	0.0	14.8	11.0	-1.3	24.5
	Max	1.5	-1.5	0.0	18.2	12.9	-1.3	29.7
DYCP (1-in-20)	Min	5.9	-2.0	0.0	3.3	6.0	-1.8	11.4
	ONS-18-P	5.9	-2.0	0.0	8.6	8.7	-1.8	19.3
	BL_H_Plan	5.9	-2.0	0.0	18.7	13.9	-1.8	34.7
	Max	5.9	-2.0	0.0	23.0	16.2	-1.8	41.3

The baseline forecast of PCC for all climate and housing scenarios (resulting from changes in the customer base, device replacement and climate change adjustments) is presented in Figure 64 and Table 22.

For NYAA, unmeasured PCC is expected to increase from 167.7 l/h/d in 2021-22 by up to 4.0 l/h/d (2.4 per cent) by 2075. Measured PCC is expected to show a decline from 145 l/h/d in 2021-22 by 8.2 per cent for the 'Max' housing scenario.

Table 22 PCC 2074–2075 comparisons with base year

Climate scenario	Measured/ Unmeasured	Unit	Base Year 2021-22	Housing Scenario (2074–75) Min	ONS-18-P	BL_H_Plan	Max
NYAA	Measured	l/h/d	145	144.2	140.3	134.8	133.2
		%	-	-0.6%	-3.2%	-7.0%	-8.2%
	Unmeasured	l/h/d	167.7	171.7	170.6	169.3	168.8
		%	-	2.4%	1.7%	0.9%	0.7%
NYCP	Measured	l/h/d	170.4	175.1	170.2	163.0	160.8
		%	-	2.8%	-0.1%	-4.4%	-5.6%
	Unmeasured	l/h/d	211.6	222.0	220.2	217.9	217.1
		%	-	4.9%	4.1%	3.0%	2.6%
DYAA*	Measured	l/h/d	149.2	148.5	144.6	138.8	137.1
		%	-	-0.5%	-3.1%	-7.0%	-8.1%
	Unmeasured	l/h/d	174.9	179.3	178.1	176.7	176.2
		%	-	2.5%	1.8%	1.0%	0.7%
DYCP*	Measured	l/h/d	188.4	194.4	188.9	180.8	178.3
		%	-	3.2%	0.2%	-4.1%	-5.3%
	Unmeasured	l/h/d	242.8	255.0	252.9	250.2	249.2
		%	-	5.0%	4.1%	3.0%	2.6%

*DY = 1-in-20 year

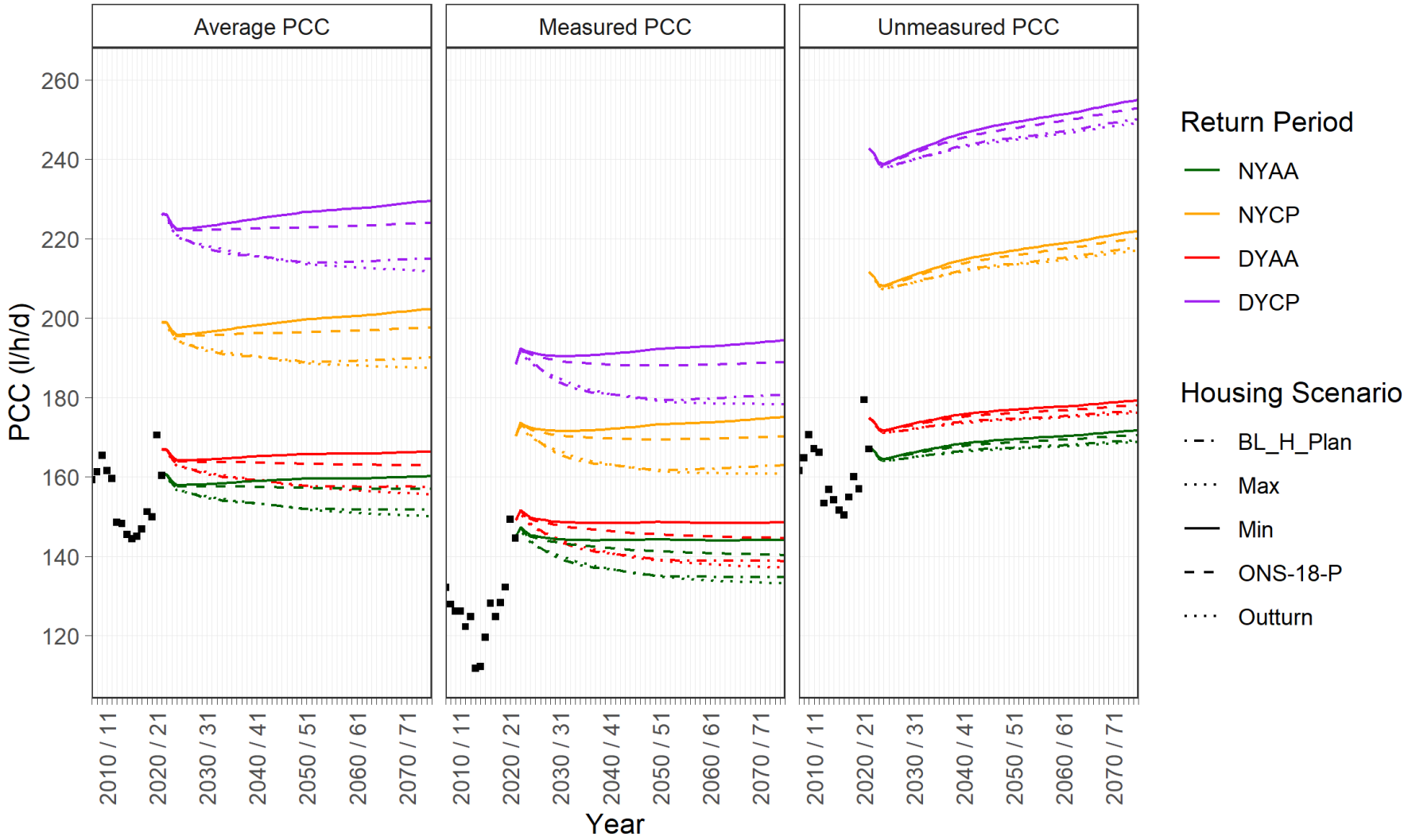


Figure 64. Baseline Forecast PCC for all housing and climate scenarios (DY = 1-in-20 year)

4.3.4 Water efficiency

Our approach to water efficiency has been multi-faceted. Following a cost benefit review of the effectiveness of several interventions we have selected a suite of activity we feel would be our most influential (and have the highest uptake), whist also providing value for our customers.

Since the dWRMP24 we have produced a Water Efficiency strategy document which details these actions. Appendix 10B, Section 2 provides further detail on our baseline programme of water efficiency. This includes:

- Physical solutions (metering, home water efficiency checks, use of smart and leakbot technology and the supply of water efficiency gadgets).
- Behavioural solutions (water efficiency platform, communications, smart metering trials, interactive consumption conservation).
- Replacement solutions (provision of subsidised water efficiency butts).

Appendix 10B also details how we plan to deliver further demand reduction as part of our preferred plan.

4.4 Baseline non-household demand forecast

For the non-household demand forecast, we commissioned Artesia to assess current and model future non-household water demand from 2025 to 2075. The method undertaken is detailed in Appendix 4B (the method was followed at a regional level for consistency). In addition, Appendix 4D provides further information on the updated non household demand forecast since the draft plan and why the original forecast is still suitable.

Non-household customers were segmented, which included five sectors grouped in terms of the main factor(s) that drives growth:

- Agriculture and other weather-dependant industries
- Non-service industries (excluding Agriculture)
- Service industries – population driven
- Service industries – economy driven
- Unclassified

To generate future projections a multi-linear regression (MLR) model was developed based on past aggregated consumption data, considering Oxford Economic variables and other factors. The model is calibrated for the base year first by industry sector using the property consumption data, then by WRZ using the Annual Return (AR) consumption. The MLR model and the calibration are then applied to future explanatory variables to estimate future non-household consumption. Forecasts are then extended from 2040–41 to 2074–75 using the total company trend between 2031–32 and 2040–41. Given that the base year is now 2021-22, the effects of Covid-19 on non-household demand are now included within the baseline (which assumes no complete recovery in non-household demand).

Given its uncertainty and less significant proportion (unmeasured non-household demand makes up less than one per cent of demand), the unmeasured sector is forecasted to remain unchanged from the base year value. The baseline forecast does not include any impact from drought measures, or from further water company intervention beyond the baseline period 2022-2025.

Artesia have produced 729 scenarios exploring uncertainty in gross value added (GVA; ±30 per cent to ±50 per cent), employment (±1.5 per cent to ±3 per cent), population (±6 per cent to ±12 per cent, selected from the Edge Analytics population forecasts) and modelled

uncertainties in climate change (UKCP18 10th-90th percentile from 12 regional climate models). They have also considered uncertainty in the development of the retail market and water efficiency scenarios (water consumption reduced by 2–16 percent by 2050–51). Artesia then derived four core forecasts with associated uncertainty scenarios:

- Upper: 90th percentile of all the scenarios each year
- Central: 50th percentile of all the scenarios each year
- Lower: 10th percentile of all the scenarios each year
- Baseline: based on assumptions surrounding policy and historical trends

This is a step change from Bottom-Up and Top-Down linear regression forecasts completed for WRMP19. Climate change impacts are also included within rdWRMP24 for non-household demand forecasts. Previously, the UKWIR Impact of Climate Change on Water Demand (UKWIR, 2013) guidance suggested that there was little evidence to suggest that climate change will have an influence on non-household water demand. This was therefore not considered in WRMP19.

The resulting estimates of future non-household demand are presented in Figure 65 and Table 23. The four forecasts provide differing projections for non-household demand. The rdWRMP24 is based on a 2021-22 base year which includes the effects of the Covid-19 pandemic on household demand, which explains the drop in demand compared to pre Covid-19. All forecasts show a gradual rise in non-household demand over the planning period, apart from the lower forecast. One of the growth factors in non-household demand is agricultural demand.

Table 23 Baseline forecast non-household demand

Scenario	Outturn 2021–22	Lower 2074–75	Baseline 2074–75	Central 2074–75	Upper 2074–75
NHH total demand (Ml/d)	29.66	27.6	38.7	35.1	41.6
2074/75 NHH total demand increase from base year (%)	-	−5%	+11.5%	+17.4%	+30.2%

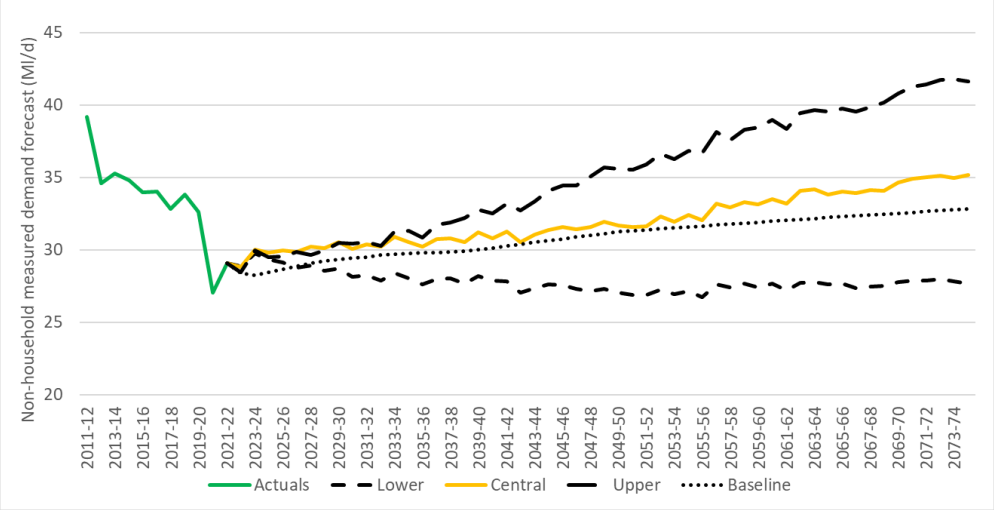


Figure 65. Baseline forecast non-household demand

We have engaged with Retailers in the pre consultation and dWRMP24 consultation. This included the Portsmouth Water and Southern Water WRMP webinar, which took place on

7th December 2022. We also directed Retailers to our WRMP consultation page and encouraged them to share their views.

4.5 Baseline demand forecasts and adjustments for New Appointments and Variations

Some customers on new housing estates are supplied by New Appointments and Variation companies (NAVs). There are three NAVs that receive potable water imports from Portsmouth Water to supply their customers. These are Leep Utilities, IWNL and Icosa water, and they are all required to develop their own WRMPs.

The baseline population, property and demand forecasts described within the sections above include areas that are supplied by NAVs. For this final WRMP24, and in response to a Defra requirement, we have removed the NAV related population, property and water demand forecasts from our WRMP24 tables. This ensures that our WRMPs are aligned and reduces the risk of double counting.

The following steps have been taken:

- We received our letter from Defra giving us permission to publish our final WRMP24 on 21st August 2024. This sets out a requirement that our final WRMP24 accounts for NAV demands and growth.
- We contacted the three NAVs with which we have contractual agreements in place, to request their latest WRMP data.
    - IWNL provided their data on 9th September.
    - Leep Utilities provided their data on 12th September.
    - Icosa responded to confirm they do not have any of the Portsmouth Water related sites in their WRMP. This is because they only start to consider sites in their WRMP when they start to supply customers with water, and the sites supplied by Portsmouth Water have yet to have occupied dwellings in place.
- Our final WRMP24 tables ('table 1g') have been updated to include separate export lines for each NAV supplied by our water resource zone. The DYAA, DYCP and Annual Limit fields have been updated to state the contractual values.
- Our final WRMP24 tables ('table 3a' to 'table 3f') have been updated to include relevant NAV contractual values in row 5BL i.e. those values that are included in the NAV WRMP data provided during September 2024.
- Our final WRMP24 tables ('table 3a' to 'table 3f') have been updated to remove growth (relative to 2021-22) in NAV population, properties and water demand to avoid double counting. This impacts rows 12BL, 14BL, 34.1BL, 34BL and 39BL within our WRMP tables.
- The adjustments to our baseline forecasts mostly impact rows associated with household population, properties and water demand. This is because there is only minor forecast growth in non-household population, property and demand within the NAV WRMP data.

We will continue to engage with NAVs and our regulators to ensure that we can robustly demonstrate alignment with NAV WRMPs in WRMP 2029.

4.6 Baseline leakage forecast

Leakage, which is defined as water abstracted and treated but not delivered to customers' taps, is of significant concern to us and our customers. Leakage comprises of distribution losses (leakage on the main network) and Use Supply Pipe Leakage (USPL).

Most of the water lost through leakage is because of leaks that occur on underground pipes without the water rising to the surface. The leaks that do result in water being visible on the surface are easy to identify and consequently are repaired quickly and so do not account for a significant proportion of the leakage we report.

Since 1995, when a standard method for leakage reporting was introduced, we have reduced leakage by 30.9 per cent. Leakage in 2020–21 was 15 per cent of the total water we put into supply. Section 3, of Appendix 10C details our current strategy to maintain leakage at current levels.

4.6.1 Leakage assessment

The WRPG suggests that leakage in the baseline forecast should remain static from the start of companies' plans to the end of the planning period. In practice, given no additional company effort the baseline would rise as the length of the network, and as the number of supply pipe connections increase with housing growth, and assets deteriorate with age.

In alignment with the guidance, however, all leakage is kept flat over the entirety of the period (Figure 66). Baseline leakage options are included in the forecast for the period leading up to the start of the WRMP24 planning horizon in 2024–25. These are consistent with the medium scenario provided as part of the WRSE options submission. Since the draft plan we have produced a new supporting appendix (see Appendix 10C) which provides further information on baseline leakage and our plans to reduce leakage (as part of our preferred best value plan).

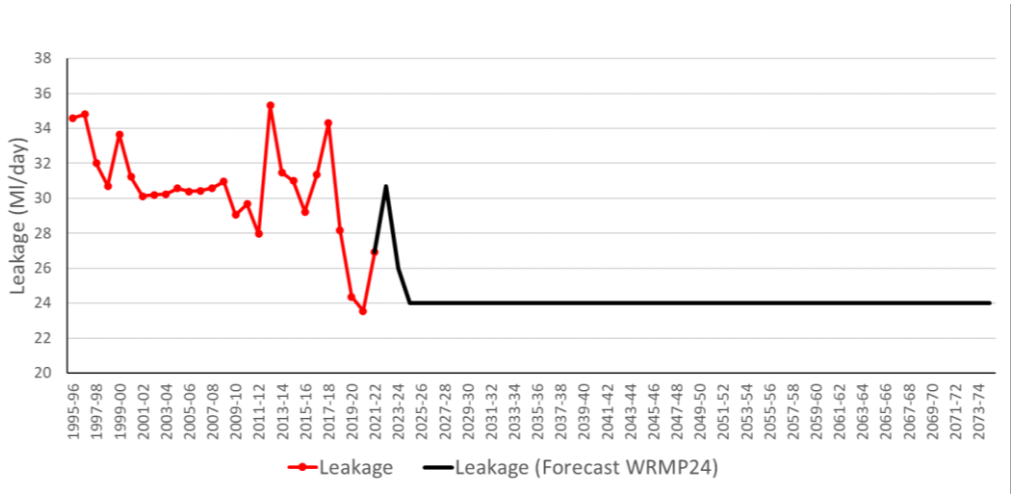


Figure 66 Leakage in Ml/d

4.6.2 Supply pipe leakage

The leakage figure we report includes unmeasured water that is lost through leaks in customer supply pipes and/or internally within customer properties. We undertake leakage detection activity to identify these leaks or customers sometimes become aware of the leaks themselves. We continue to offer up to two free supply pipe repairs or a subsidised replacement of the supply pipe.

Supply pipe leakage tends to be lower on measured properties than on unmeasured properties. If a leak occurs on a measured property, customers will notice the step change in the volume consumed. In addition, when a customer opts for a meter, a check is undertaken on the customer's supply pipe. Consequently, the leakage forecast would reduce over the period to take account of the reduction in supply pipe leakage because of the number of customers opting for a meter. However, as the supply network grows each year there would

be additional leakage in the network. In line with the guidance, we have therefore assumed a flat profile for leakage.

4.7 Other components of demand

Other components of demand include:

- Distribution System Operational Use (DSOU) – water run to waste such as that used for the purpose of mains flushing.
- Water Taken Unbilled – this includes water legally and illegally unbilled. Legally unbilled water includes water used for firefighting purposes whilst water illegally unbilled includes void properties which are actually occupied.

Water taken unbilled and DSOU are assumed to stay at the same rate over the period at 2.62 Ml/d and 0.52 Ml/d respectively. Water taken unbilled and DSOU are kept constant over the entirety of the planning period, held at 2021-22 levels.

4.8 Demand summary

The total baseline demand for all scenarios and summary of demand for reported adaptive planning pathway 4 (also referred to as 'situation 4' in the WRSE investment model) are summarised in Figure 67 and Table 24.

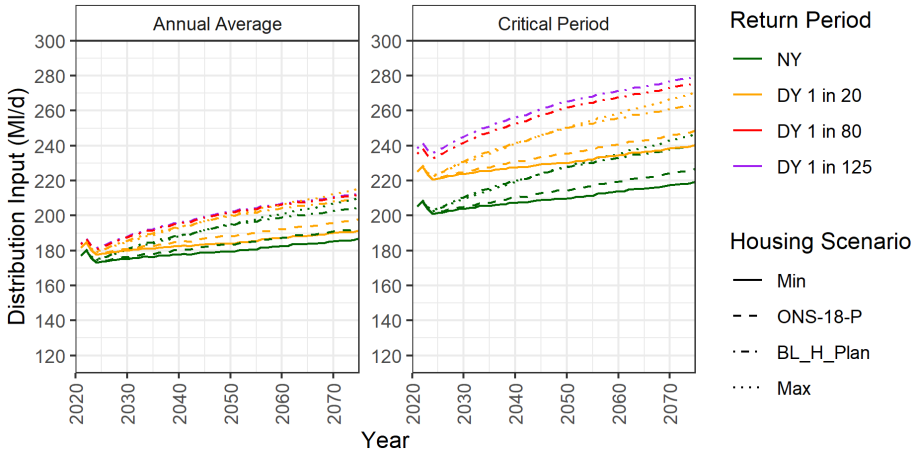


Figure 67. Distribution input (Ml/d) for all situations.

Table 24. Demand summary table for adaptive planning pathway 4 for a 1-in-20 year dry year under DYAA conditions (Ml/d)

	2025–26	2029–30	2034–35	2039–40	2044–45	2049–50	2074–75
Household	135.0	139.1	143.3	146.3	149.2	152.2	158.6
Non-household	30.59	31.16	31.16	31.84	32.01	32.29	35.80
Void properties	0.40	0.40	0.40	0.40	0.40	0.40	0.40
Distribution Losses	10.37	10.37	10.37	10.37	10.37	10.37	10.37
Distribution System Operational Use	0.52	0.52	0.52	0.52	0.52	0.52	0.52
Water Taken Unbilled	2.62	2.62	2.62	2.62	2.62	2.62	2.62
Total Distribution Input	179.48	184.20	188.38	192.09	195.13	198.35	208.32
Leakage (distribution losses + USPL)	24.00	24.00	24.00	24.00	24.00	24.00	24.00

4.9 Non public water supply demand

Our demand forecast is based on demand from our connected properties and population and does not contain an allowance for non-connected properties or population. The National Framework highlights the necessity to also understand the pressure on water resources from other sectors that are not supplied by water companies – i.e. non-public water supply. It stresses the need for regional groups to work with these sectors to develop a better understanding of their water needs and explore solutions to meet existing and future demand, as well as protecting the environment. The National Framework shows how water is used across England and the sectors that are important for each region.

Analysis undertaken by WRSE indicates that current non-public water supply demand is within the current abstraction licence volumes available to these sectors in the short term. However, for WRMP29, the longer term needs of non-public water supply demand will be captured by incorporating the agricultural sector's non-public supplies, including any agricultural sector licence capping within the regional investment modelling. For further information on the analysis undertaken by WRSE, please refer to WRSE Technical Annex 1[30].

5 SUPPLY FORECAST

5.1 Introduction

The majority (89 per cent) of the water supplied by us to customers is derived from the local Chalk aquifer. It is either taken from boreholes directly from the Chalk aquifer or captured as it emerges from the Chalk aquifer via springs. In addition, the company has one surface water abstraction from the River Itchen.

This section of the WRMP24 describes how much water we estimate is available to us to put into supply. It presents the latest supply calculations, referred to as Deployable Output (DO) assessments. These assessments consider factors that could affect DO, such as bulk supplies to neighbouring water companies, process losses, potential source outage and the potential

[30] Home | WRSE - Water Resource South East

impact of climate change. The estimates of available DO are presented at the whole water resource zone level and have been revised for this WRMP24.

The key components of the supply side forecast are outlined briefly below with more detail in the following sub-sections. the supply forecast covers:

- Deployable Output Assessment
- Bulk Supplies
- Sustainability Reductions and longer-term environmental destination
- Climate Change
- Outage Assessment
- Process Losses

How these components of supply relate to each other to generate an overall "water available for use" is presented in Figure 68. This specific illustration represents a hypothetical scenario.

Because Havant Thicket Reservoir has received planning permission and is in the construction phase, it is included as part of our baseline plan, so is included in the supply forecast.

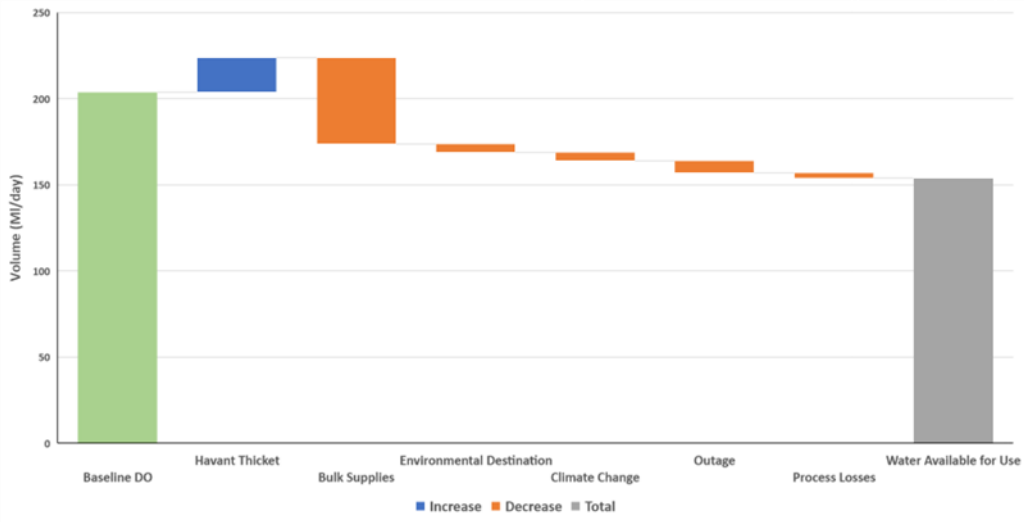


Figure 68 Illustrative plot showing how water available for use is calculated

5.2 Deployable output assessment

We review and update our DO values, and submit these to the Environment Agency and Ofwat, every five years as part of our WRMP submission. For this plan, WRSE have developed a regional system simulation model to inform and support our WRMP24 submission. WRSE have produced a method statement for the assessment of DO which is presented in Appendix 5C.

"*the supply capability for a water resources system under specified conditions, as constrained by: hydrological yield; licensed quantities; the environment (via licence constraints); abstraction assets; raw water assets; transfer and/or output assets; treatment capability; water quality; and levels of service, as defined by the Water Resources Planning Guideline*."

The regional system simulator was further refined and modified to better represent our supply area and then used to assess DO at a WRZ scale. This section summarises the work undertaken and the DO results relevant to our supply area across the planning period.

5.2.1 Critical period and planning scenarios

Historically, our reliance on groundwater supplies and our low level of raw water storage has meant critical period scenarios have been our most challenging. The critical period for us is associated with peak summer demand. For this reason, a critical period scenario (peak-week summer demand) has been included within the WRMP24 DO assessment.

The links between planning scenarios and the DO estimates within our WRMP24 are as follows:

- The assessment of Average Demand Deployable Output (ADO) is linked to the dry year annual average (DYAA) planning scenario.
- The assessment of the Peak Demand Deployable Output (PDO) is linked to the critical period (DYCP) (peak-week summer demand) planning scenario. Based on analysis of the demand profiles used in the regional system simulator, the Peak week typically occurs in mid-August but could occur in any summer month.

5.2.2 Move to 1-in-500 year drought resilience

Previous iterations of WRMPs have focused on assessing water companies' supply capability against droughts that have happened historically. The use of the historical record provides datasets that allow robust comparison of performance in actual events but does not allow for the analysis of the impacts of droughts which could plausibly happen in the future. Consequently, the use of 'stochastic' climate datasets is best practice within water resources planning, driven by a need to consider the impact of droughts that are more extreme than those previously observed in the historic record. Stochastic data is described as having a random probability distribution or pattern that may be analysed statistically but may not be predicted precisely.

The need for water companies to consider droughts beyond those in the historical record was specified by previous WRPG requirements that water companies demonstrate how they would make their water supply systems resilient to a 1-in-200 year drought as part of WRMP19. The new WRPG requirement for WRMP24 is that companies' water supply systems are resilient to a 1-in-500 year drought by 2039.

WRSE has generated 400 replicates of a 48-year baseline sequence cumulating in a stochastic dataset that represents 19,200 years of daily data. The method statement produced by WRSE (see Appendix 5D) provides a summary of the data as well as highlighting its key features and differences to WRMP19. This stochastic dataset, primarily composed of rainfall and potential evaporation (PET) data, has been post-processed to provide groundwater level data that has been utilised in our WRMP24 DO assessment. This same post-processing process was used to generate the perturbed groundwater level data for the climate change DO assessments from the perturbed climate change stochastic data. The DO assessment is presented in the sub-sections below, including 1-in-200 year DOs that apply to the Dry Year scenarios up to 2038–39 and 1-in-500 year DOs that apply to the Dry Year scenarios in 2039–40 and beyond.

5.2.3 Previous deployable output assessments

AECOM undertook the DO assessment for our WRMP19 submission, with subsequent updates by Akins for the Revised WRMP19 (Dec 2022) using the Pywr model. The Pywr model estimates WRZ DO for a range of plausible droughts that are more severe than those experienced in the past. The Average demand Deployable Output (ADO) has been calculated by increasing the demand profile in the Pywr model until the demand can't be met (i.e. generate failures). This provides the corresponding ADO. The ADO and corresponding Peak summer demand Deployable Output (PDO) results are provided in Table 25.

The reassessment of Water Resource Zone DO for the Revised WRMP19 has resulted in a marginal increase in DO across a range of drought conditions, relative to the Final WRMP19. Whilst the improved representation of our supply network within Pywr might be expected to constrain DO, the Pywr model ensures that abstraction is weighted towards our spring and surface water sources. Building on preliminary work within our Final WRMP19 DO assessment, we used the Environment Agency's regional groundwater model to further understand the impact of differing levels of abstraction on the Chalk aquifer. This understanding was then translated into the Pywr model, such that resting groundwater sources to preserve storage in the Chalk aquifer leads to a higher overall DO in drought.

Table 25: Summary of WRMP19 DO values by return period

Return Period	PDO (Ml/d)	ADO (Ml/d)
1-in-10 year	288	232
1-in-20 year	287	230
1-in-80 year	261	213
1-in-125 year	250	204
1-in-200 year	239	194
1-in-500 year	241	192

5.2.4 Reassessment of deployable output for WRMP24

5.2.4.1 Development of the regional system simulator

The regional system simulator (RSS) has been developed using a Pywr model. Pywr was selected as the platform for the RSS following a detailed review of available options conducted for WRSE (see Appendix 5E).

Pywr allows a better representation of our supply zone than has previously been achieved with a better representation of network connections and constraints as well as the bulk supplies to Southern Water's Hampshire and Sussex North regions.

A design goal of the Pywr model that we have developed for our DO assessments was to be able to operate as both an independent model of our supply area and as a component of the larger RSS. In each case the model has been developed to allow utilisation of the 19,200 years of stochastic data developed by WRSE. This WRMP24 follows the current WRPG, utilising the stochastic sequences to assess DO across a range of return periods up to a 1-in-500 year event.

5.2.4.2 Further development of the Pywr model

Three iterations of the Pywr model have been produced as part of our WRMP process. These include:

- The original model, model 1, which was developed in conjunction with WRSE for use as part of the WRSE RSS,
- The Portsmouth Water WRZ Pywr model, model 2, which was the version of the model used to inform our dWRMP24 DO assessments, and

- The Hampshire Pywr model, model 3, which is the most recent version developed for our WRMP24 DO assessments which, as with the previous two models, can be operated independently or coupled with the RSS, but additionally can be coupled with a selection of Southern Water's WRZ's that have interconnections to our supply area. This model is sometimes called the 'Hampshire Model' due to its coupling with Southern Water and is the model that has been utilised for the baseline and climate change DO assessments presented within this document.

As well as contributing to the DO assessment the updated Pywr model has been utilised in options and network enhancement assessments including identification of the Source O Booster supply-side option.

The Pywr modelling has been undertaken using the same stochastic inputs that were created for WRSE, however a number of network and supply options were created in our model that could be included or excluded from model runs appropriate to the required assessment. Details of these features are outlined below and options such as the Source O Booster enhancement are discussed in the options section of this WRMP24. As well as the DO assessment presented hereafter the outputs of this modelling have been used in the supply forecasts provided to WRSE.

5.2.4.3 WRMP19 assumptions

Updates and enhancements to sources within our WRZ are being undertaken in advance of the start of the WRMP24 planning horizon in 2025–26. These updates have been reflected in the latest DO modelling and are described below. DO resilience schemes were proposed at four of our groundwater sites in our Final WRMP19, with proposed solutions to target the following improvements.

Source O Water Treatment Works (WTW): When groundwater levels drop below the adit level, turbidity issues were experienced at this site. The aim of this scheme, which has been successfully delivered in AMP7, was to mitigate that impact and therefore provide an additional DO.

Source C WTW: Air and turbidity issues are experienced when running the larger borehole pumps; this scheme is to mitigate that impact and therefore provide an additional 4 Ml/d between 1-in-20 and 1-in-200 drought conditions. This scheme is in progress and is due to be completed before the end of AMP7.

Source H WTW: Turbidity issues were experienced when running at higher flows. The aim of this scheme, which has been successfully delivered in AMP7, was to mitigate that impact and therefore provide an additional 2 Ml/d between 1-in-20 and 1-in-200 drought conditions.

Source J: An assessment to Source J was proposed during our dWRMP24 to provide resilience to supplies once the bulk transfer to Southern Water from Source A increases from 15 Ml/d to 24 Ml/d in 2024–25. However, following borehole investigations at Source J, the additional 9Ml/d bulk supply to Southern Water was not considered to be viable. The enhanced deployable output at Source J and the bulk supply to Southern Water has therefore been removed from our WRMP24 and the regional WRSE modelling. This has been clearly communicated with Southern Water through our ongoing discussions and via formal letter.

5.2.4.4 Revised assumptions for WRMP24

In November 2020 we commenced our 'Deployable Output Recovery Scheme' project (AECOM, 2021). The objective of this was to determine the maximum 1-in-200 year DO from our Sources O, H and C, utilising the current assets and treatment processes ensuring regulatory and process compliance. The project was completed by AECOM in March 2021

giving us a clearer understanding of what each of the schemes would achieve in a 1-in-200 year drought event.

The estimated benefits for schemes at Sources, O, H, and C had previously assumed there are no pipeline transfer constraints within our supply network. During autumn 2021 we were able to model the schemes within our Pywr model and then again in January 2023 using the new Hampshire Pywr model. This provided a more accurate estimate of scheme benefits by including a representation of our supply network (Table 26).

The DYCP scenario benefits are lower than originally anticipated because water from the schemes cannot be fully transferred to the parts of our WRZ where this water is most needed.

The Portsmouth Water WRZ Pywr modelled benefits were used within the latest WRMP19, and the Hampshire Pywr model was used to form part of our upload to the regional investment modelling towards our WRMP24 tables.

Table 26: Summary of revised DO of WRMP24 groundwater enhancements

Source	1-in-200 Average Benefit (Ml/d)	1-in-200 Peak Benefit (Ml/d)	Implementation Date
GW Schemes total benefit (maximising DO at Source O, C & H)	7.6	10.5	Source C to be implemented in 2024–25. All other schemes have been delivered.

5.2.4.5 DO assessment methodology

We have followed the WRSE method statement for the assessment of DO using the Hampshire Pywr model and utilising the newly developed stochastic datasets from WRSE.

The WRSE method statement discusses recording a count of the number of events requiring imposition of drought orders as the describing metric for DO. However, because demand restrictions within our WRZ are based on the groundwater level at Well 'X' and not on the residual volume of a given water-storage or collection of storage location, this approach is unsuitable for us. To better assess the supply-system DO, we counted the number of events which cause demand deficits to occur at each level of demand. The return period of demand deficits (and therefore DO) was determined from this figure.

The focus of the WRSE modelling and the inputs required to feed into the investment models is at a WRZ level, which for us means the whole of our supply area. Therefore, source level DOs were not required for regional planning purposes and were not explicitly re-assessed (although source licence and other constraints are included in the water resource model to derive the overall WRZ level DO).

For the planning tables, we have provided a summary of source level DOs based on disaggregating the supply area DO figure based on the previous WRMP19 source DO values. Values have then been cross checked against known constraints, e.g. licence or pumping constraints to assure the values calculated.

The calculated source DOs are described in section 5.2.8.

5.2.5 Levels of service and drought plan links

When drought conditions begin (and our groundwater levels drop below the first Drought Trigger level), we implement our drought plan. This could lead to a steady escalation of restrictions on the demand for water. The first step is to undertake media campaigns appealing to our customers for voluntary restraint, but then proceeds through temporary use bans (TUBs) such as bans on the use of hosepipes, and Non-essential use bans (NEUBs) that may start to impact businesses in the local area.

As a last resort, water companies may also ask for emergency drought orders (e.g. use of standpipes and rota cuts to reduce the demand for water), although these are part of the Emergency Plan and not the Drought Plan.

The Level of Service that we plan to is based on a careful balance between affordability (of implementing and developing new sources) and the risk of restrictions to our customer's water supplies. Less investment and lower water bills for customers would fund a lower level of service, and conversely, greater investment and higher customer bills could reduce the risk of restrictions to customers but could be less affordable for customers. After listening to our customers, our Levels of Service remain unchanged since WRMP19, as the research has shown our customers are willing to pay for a continuation of their current level of service. We have agreed with our customers the frequency at which demand restrictions might need to be implemented. The agreed Levels of Service (LoS) as defined in our current Drought Plan are as follows:

- Temporary Use Bans (1 in 20 years or 5% annual chance),
- Non Essential Use Bans (1 in 80 years or 1.25% annual chance),
- Drought Permits/Orders (1 in 125 years or 0.8% annual chance, changing to 1-in-500 years or a 0.2% annual chance from 2041-42), and
- Level 4 Emergency Drought Orders such as standpipes and rota cuts (1-in-200 years or 0.5% annual chance, changing to 1-in-500 years or a 0.2% annual chance from 2039-40).

Our Pywr model uses 19,200 years of synthetically generated but plausible years of weather data, known as a stochastic data set. Over these 19,200 years of plausible weather data that are modelled, the TUBs trigger is reached at some point (usually during the summer) in 949 of these years. This is a 1 in 20 likelihood. NEUBs are triggered in a quarter of the years of weather data where TUBs have been triggered (which is equivalent to 1-in-80 years).

As set out in our statutory Drought Plan, the implementation of both TUBs and NEUBs are triggered by the groundwater level in a specific observation borehole receding to predefined levels. This borehole is not used to provide drinking water and the level in it is unaffected by drinking water abstractions. It is therefore an indication of natural groundwater levels in the aquifers under our supply area. The groundwater level in our drought indicator well is relatively unaffected by the implementation of the Havant Thicket Reservoir or other supply side schemes in the WRMP24. Therefore, the Havant Thicket Approved Scheme does not impact the likelihood of TUBs or NEUBs for our customers. The Level of Service we plan to is recorded in our Pywr supply model and the frequency of restrictions is verified through post processing checks.

Regulatory guidance states that "You should plan, where appropriate, to use drought permits and orders less frequently in future, particularly in sensitive areas." To comply with this, from 2041-42 we have 'switched-off' the ability to benefit from our only supply side drought permit. Therefore, the modelled LoS for Drought Permits/Orders changes from 1 in 125 years to 1-in-500 years (or 0.2% annual chance) i.e. we stop relying on this drought permit to achieve 1-in-500 year resilience, but it might still be needed in an emergency for drought events of 1-in-500 year or worse.

The frequency or annual risk of drought restrictions reflected in our committed Levels of Service has not resulted in a reduction in deployable output. The impact of our change to the frequency of Level 4 drought restrictions has been achieved through revised deployable outputs with a 'LoS' element included in the modelling up until 2039-40 to effectively maintain the current 1-in-200 supply capability in the modelling until we fully transition in to a 1-in-500 year level of drought resilience as required by the regulatory guidelines.

Level 4 indicates the drought severity at which we plan to supply a secure and reliable water supply up to. If we experienced a drought which was worse than our Level 4 Level of Service we would have to resort to our Emergency Planning measures. Regulator guidance for WRMP24 requires us to increase the resilience of our system from a 1-in-200 to a 1-in-500 year drought by 2039. To achieve this, our baseline deployable output is reduced. All new supply options will be implemented assuming a 1-in-500 year DO benefit.

By 2039-40 we will have fully transitioned to a 1-in-500 year level of drought resilience. This is reflected in the modelled and the minimum rows of Table 2f (of the WRMP24 planning tables) by our Level 4 Emergency Drought Orders changing from 1-in-200 year to a 1-in-500 year (or 0.2%) drought from 2039-40 onwards.

Following the requirements of the WRPG, baseline DO figures are calculated without the benefit of demand saving measures (media campaigns, TUBs and NEUBs). However, the DO benefit of these reductions can be determined using the same DO assessment methodology with the reductions implemented. The demand reduction factors associated with each formal intervention for demand reduction are:

- TUBs: 7.2 per cent reduction (92.8 per cent of demand remains)
- NEUBs: 11.9 per cent reduction, inclusive of the TUBs reduction (88.1 per cent of demand remains)

The DO assessment results are used within the WRMP process to understand the impact of drought conditions on the supply-demand balance. It also allows the calculation of any required investment costs should demand restrictions and supply-side drought permits not be permissible.

5.2.6 Havant Thicket Winter Storage Reservoir

The WRPG states that:

> *"Your baseline scenarios should include benefits of schemes that have met one or more of the following conditions: have planning permission to go ahead; a funding allowance made by Ofwat in a business plan for delivery of the scheme; or other necessary permissions such as abstraction licences or environmental permits."*

Havant Thicket Reservoir has received planning permission and is therefore included as part of our supply baseline from 2031-32[31] onwards, when it is programmed to have been constructed and filled (there is no risk to our supply demand balance due to this delay as the water is intended for Southern Water). Havant Thicket Reservoir has also been "pre-selected" in the WRSE regional investment model to account for this. The reservoir is

[31] The delay is the result of an opportunity to future proof the pipeline tunnel in the approved scheme. The pipelines put inside the single tunnel would only initially be used by Portsmouth Water to fill the reservoir with spring water and take water out again. They would not be used for recycled water unless, and until, the HWTWRP has received the official go ahead to proceed and has been constructed.

currently in the construction phase and will be filled and topped up using chalk spring water from Source B in the winter.

Havant Thicket Reservoir provides a drought resilient resource which maintains its output during low flows and droughts, when Southern Water need it the most. It means we can provide Southern Water with a bulk supply of water, allowing them to reduce abstractions in the River Itchen catchment and protect and conserve chalk stream environments. This bulk supply is treated as an option within the WRSE investment model.

The DO benefit of the Havant Thicket Reservoir was most recently reported within the revised (December 2022) WRMP19 planning tables, which state the ADO benefit of Havant Thicket as 21.1 Ml/d for the 1-in-200 year scenario. Table 27 below presents the revised assessment of DO for WRMP24 at each return period for the baseline position. This was derived using the new Hampshire Pywr model, which was also used to assess the benefits of Portsmouth Water WRMP24 options and Southern Water's HWTWRP option (including conjunctive use benefits).

Table 27: DO Benefit of Havant Thicket Reservoir in the baseline scenario

Return Period	DO Benefit of Havant Thicket Reservoir for use in WRSE (Ml/d)
1-in-2 average*	0.0
1-in-100 average	12.3
1-in-100 peak	9.4
1-in-200 average	17.8
1-in-200 peak	14.6
1-in-500 average	20.0
1-in-500 peak	18.1

* For the 1-in-2 average and peak return period no DO benefit is realised. This is due to the protection of the supply in Havant Thicket Reservoir for use in drought years.

We received a range of consultation comments on the Havant Thicket Reservoir scheme in terms of background to the scheme, the mitigation and the planning application. These comments have been addressed in Section 2.1 to 2.3 in the new supporting Appendix jointly produced by Southern and Portsmouth Water (Appendix 7F).

5.2.7 WRZ deployable output assessment

As described previously, the WRZ DO assessment used the Python for Water Resources (Pywr) model; the new Hampshire Pywr model. The Pywr model uses individual source constraints, group licence constraints, resource availability (based on Well 'X' groundwater levels) and a profile of demand to develop DO for a range of drought return periods.

Simulated demand, distributed through the year according to the demand profile, is increased within the model to generate supply failures. The return period of our WRZ DO therefore relates to the return period of these modelled supply-demand failures, rather than the return period of rainfall, groundwater levels or water-storage health as discussed in section 5.2.4.5.

At each step of simulated demand the frequency of observed demand deficits, that is the volume of demand not met by available supply, is recorded. Simulated demand was increased until failures occurred at the required frequency to define the DYAA and DYCP DO

at a range of return periods of interest; 1-in-500, 200, 100 and 2 years. This is known as the 'Scottish' method of DO assessment and is in line with the WRSE method statement.

The DYAA DO is the annual average level of demand that could be sustained at each return period when failures were considered. The DYCP DO is the peak level of demand that could be met during the peak week of demand, and that caused failure at the specified frequency. The DYCP DO was also assessed using the Scottish DO method in which demand was increased until the frequency of failure reached the required return period; 1-in-500, 200, 100 and 2 years. The critical period is associated with peak-week summer demand.

The values provided in Table 28 show the amount of water supplied from our sources in these conditions.

Table 28: Summary of DO assessment outputs – DYAA and DYCP

Return Period	DYAA DO (Ml/d)	DYAA DO (Ml/d) with Havant Thicket	DYCP DO (Ml/d)	DYCP DO (Ml/d) with Havant Thicket
2	247.8	247.8	306.0	306.0
100	221.1	233.4	274.4	283.8
200	202.7	220.5	250.8	265.4
500	193.4	213.4	240.0	258.1

5.2.8 Source deployable output assessment

As described previously in section 5.2.4.5, we have developed source DO values by apportionment of the WRZ level DO values that were calculated using the Pywr model.

Since the rdWRMP24 we have undertaken further DO testing to assess the impact of removing Source E from the Pywr model. This is because our production planning does not include abstraction from this source. We have now confirmed that the WRZ level DO is not impacted, because Source A can make up the shortfall. Therefore Source E is reported to be an unused licence with zero DO and has been moved from Table 1a to Table 1c.

Table 29 and Table 30 below provide a summary of the ADO and PDO for each source for a selection of return periods.

Table 29: Average deployable output by source in our water resource zone

Source works	1-in-2	1-in-100	1-in-200	1-in-500
Source A	41.4	34.1	21.8	20.5
Source B	58.0	48.6	45.6	43.5
Source C	18.9	18.1	17.3	16.5
Source D	1.2	0.8	0.9	0.8
Source F	7.2	7.2	7.2	7.2
Source G	1.6	1.6	1.6	1.5
Source H	8.4	8.0	7.7	7.3

Source works	1-in-2	1-in-100	1-in-200	1-in-500
Source I	1.6	1.5	1.5	1.4
Source J	10.0	8.9	8.8	8.4
Source K	10.5	10.0	9.6	9.1
Source L	15.6	14.5	13.8	12.9
Source M	4.9	3.4	4.0	3.9
Source N	27.0	25.2	23.9	22.4
Source O	4.0	2.4	3.0	2.8
Source P	9.2	8.8	8.4	8.0
Source Q	9.6	9.5	9.2	8.7
Source R	10.0	10.0	10.0	10.0
Source S	2.1	2.1	2.0	1.9
Source T	6.4	6.4	6.4	6.4
Total	247.8	221.1	202.7	193.4

Table 30: Peak Deployable output by source in our water resource zone

Source works	1-in-2	1-in-100	1-in-200	1-in-500
Source A	46.0	41.7	39.2	39.1
Source B	73.3	53.0	46.54	41.8
Source C	24.6	22.9	21.49	21.4
Source D	2.6	2.1	1.81	1.6
Source F	12.4	12.1	11.56	11.3
Source G	2.6	3.1	2.77	2.5
Source H	9.12	9.2	8.69	8.7
Source I	2.0	2.0	1.81	1.8
Source J	10.2	10.4	9.74	7.5
Source K	12.3	12.4	11.65	11.6
Source L	16.0	15.2	14.04	13.6
Source M	6.3	4.9	3.73	2.7
Source N	36.4	35.8	33.62	32.3
Source O	4.0	2.7	1.62	1.2
Source P	10.0	10.2	9.55	9.5
Source Q	13.0	12.3	11.08	11.1
Source R	14.0	13.3	11.94	12.0

Source works	1-in-2	1-in-100	1-in-200	1-in-500
Source S	2.5	2.5	2.29	2.4
Source T	8.8	8.5	7.64	7.8
Total	306.0	274.4	250.8	240.0

5.3 Existing bulk supplies

We provide bulk supplies to our neighbouring water company, Southern Water. This section describes each of those existing bulk supplies in more detail. Since the draft plan we have produced a new supporting Appendix (1C) which clarified the planning assumptions for bulk supplies with Southern Water. Please refer to this appendix for further information. The appendix also details analysis undertaken to minimise exports to Southern Water in normal years to reduce the risk of increases in abstraction and therefore Water Framework Directive no deterioration risk. Options to provide new additional bulk supplies are discussed later in Section 7 of this WRMP24.

This section also confirms the contractual volumes associated with New Appointments and Variations NAVs.

5.3.1 Southern Water - Sussex North

We have an existing bulk supply agreement with Southern Water to supply their Sussex North WRZ. The infrastructure necessary for this bulk supply was constructed in 2004.

The maximum transfer rate is 15 Ml/d and only allows water to flow from Portsmouth Water to Southern water.

There is a cross connection between the bulk supply to Sussex North and an existing Southern Water main to its Sussex Worthing WRZ. This connection provides operational flexibility for Southern Water but does not increase the total transfer capacity. Therefore, it was not considered material within our WRMP24, but is a consideration in Southern Water's WRMP24.

Within the WRSE investment model the existing 15 Ml/d bulk supply to Sussex North is treated as part of the baseline until 2025–26, beyond which point it becomes an option that can be selected if required.

5.3.2 Southern Water - Hampshire Southampton East

We have an existing bulk supply agreement with Southern Water to supply their Hampshire Southampton East (HSE) zone. The bulk supply exports up to 15 Ml/d from us to Southern Water's HSE WRZ. Flow is abstracted from the River Itchen at Source A, treated at Source A treatment works and then transferred to Southern Water.

An extension to this bulk supply by 9Ml/d had been previously considered as part of WRMP19. This was, however, conditional upon successful enhancement of Source J to facilitate the transfer of an additional 9Ml/d to Southern Water. In our dWRMP24 we highlighted the on-going borehole investigations at Source J. Following completion of these investigations, the additional 9Ml/d bulk supply to Southern Water is no longer considered to be viable. The enhanced deployable output at Source J and the bulk supply to Southern Water has therefore been removed from our WRMP24 and the regional WRSE modelling. This has been clearly communicated with Southern Water through our ongoing discussions and via formal letter.

Within the WRSE investment model the 15 Ml/d bulk supply to the HSE WRZ is treated as part of the baseline until 2028–29, beyond which point it becomes an option that can be selected.

Additionally, once Havant Thicket Reservoir is constructed and commissioned, an additional bulk transfer of up to 21 Ml/d can be made to the HSE WRZ via a new bulk supply. The WRSE investment model does not include this additional bulk supply within the baseline supply forecast. Instead, it is treated as an option that can be selected from 2031-22.

5.3.3 Third Party Supplies

No third-party suppliers responded to Portsmouth Water with an offer of supplies.

5.3.4 Imports

We do not currently have any bulk supply imports in the baseline.

5.3.5 New Appointments and Variations

Since the dWRMP24 we have reviewed our baseline New Appointments and Variations (NAVs) allowances. The outturn bulk supplies to NAVs in 2021-22 are summarised below, which combined bring a total demand of 0.57 Ml/d:

- Leep Utilities (Leep): 0.567 Ml/d
- Independent Water Networks Limited (IWNL) 0.001 Ml/d

In the WRSE investment model run for our rdWRMP24 the 0.57 Ml/d base year demand from NAV's was not accounted for. Instead we undertook sensitivity testing to demonstrate there was no risk to security of supply resulting from the omission.

The WRSE model run for our final WRMP24 now includes the 0.57 Ml/d as a baseline demand. This is one of the drivers for the Source O booster upgrade scheme being selected in an earlier year compared with the rdWRMP24.

With respect to future demand, whilst the location of future NAV sites is unknown, forecast growth in population, properties and demand is captured within our wider demand forecast as detailed in Section 4. However, for existing NAV sites within NAV WRMPs, and as part of our final WRMP24 updates, we have:

- Incorporated the NAV WRMP contractual volumes into our potable exports within WRMP24 Table 3.
- Removed the NAV WRMP growth in population, properties and demand (beyond 2021-22) from our own demand forecast in WRMP24 Table 3 (see Section 4.5).
- Adjusted our target headroom to ensure there is no double counting of risk and uncertainty (see Section 6.3).

This ensures that our WRMP is aligned with the NAV WRMPs and reduces the risk of double counting.

5.4 Sustainable Abstraction

We recognise the global importance of chalk aquifers and streams within our supply region and are committed to reducing the effects of abstraction on the environment and bringing enhancements where possible. In addition to the priority chalk habitat, our supply region also contains five Special Protection Areas (SPAs); four Special Areas of Conservation (SACs); 32 Sites of Special Scientific Interest (SSSIs); five National Nature Reserves (NNRs) and 26 Local Nature Reserves (LNRs). This is reflected in our vision, which recognises *Sustainable*

water supplies for our customers, which protect and enhance our environment as one of our four priority areas.

As a result, our next business planning period (Price Review 2024 (PR24) and WRMP24) have commitments to firstly assess the effects of our current abstractions and secondly implement mitigation to protect and enhance the aquatic environment. Our work focuses on the following drivers:

1. Restore the effects of potential over-abstraction from aquifers and rivers.
2. Prevent deterioration in environmental status from growth in abstraction.
3. Prevent future deterioration due to environmental changes i.e. linked to climate change (moving to proactive protection, rather than reactive).
4. Ensure no significant negative effects from proposed options as part of the WRMP24.
5. Prevent negative effects from temporary increases in abstraction (i.e. via drought permits).
6. Ensure our time limited licence variations are sustainable.

These drivers can be mapped to three core workstreams for PR24 which will primarily be delivered via our PR24 Water Industry National Environment Programme (WINEP)[32] and other investigations and assessments we have put forward. These workstreams are:

- Environmental Destination (including Licence Capping)
- Drought Permit Options
- Time Limited Licence Variations

Since the dWRMP24 we have produced a new supporting Appendix 5B 'Investigating and Achieving Sustainable Abstraction'. This appendix provides detail on how we plan to investigate and achieve sustainable abstraction. The appendix also provides additional details requested via the consultation, in particular time limited licence variations, how we will manage risk, how we will consider nature-based solutions and information on our priority catchments. Due to the inclusion of this new appendix, the following section provides a high-level overview, with Appendix 5B providing the technical detail.

5.4.1 Environmental Destination (including licence capping)

The Environment Agency (EA) completed a longer-term environmental water needs assessment as part of the Water Resources National Framework[33]. This work established a view on the potential licence reductions required by 2050 for rivers to meet their Environmental Flow Indicators (EFI). Unless proven to the contrary by local data driven evidence, the EA consider meeting EFI to be a requirement for a river achieving or maintaining "good ecological status". The EFI is defined by an Abstraction Sensitivity Band (ASB) allocated to each waterbody; ASB1 represents low sensitivity water bodies and under low flow conditions the percentage of allowable abstraction from natural flows is 20%; ASB2 water bodies are moderate sensitivity (15%); and ASB3 water bodies are high sensitivity (10%).

In response to the Framework, WRSE developed an environmental ambition method to establish a series of alternative longer-term 'futures' which can be used to derive an adaptive

[32] The primary role of the WINEP is to provide information to water companies on the actions they need to take to meet the environmental legislative requirements that apply to water companies in England.

[33] https://www.gov.uk/government/publications/meeting-our-future-water-needs-a-national-framework-for-water-resources

regional plan and hence identify a series of pathways through which these different outcomes might be delivered in practice. These futures represent different anticipated levels of environmental protection, which will help to move towards planning for proactive protection rather than retrospective remediation. The WRSE approach allows the issues to be mapped out and schemes to be identified to deliver water resource benefits that can be put forward by water companies to improve the resilience of the environment against future scenarios. This is a step change in approach from previous plans.

The outcome of this method results in a range of potential abstraction licence reductions, which in turn, reduce deployable output. These reductions have been embedded into our baseline supply demand balance. Since the dWRMP24 we have revised our potential environmental destination futures (and therefore the sustainability reductions included in the plan), which overall results in greater reductions, occurring sooner. A comparison of the potential sustainability reductions between the dWRMP24 and rdWRMP24 is presented in Figure 69. The rdWRMP24 reductions are adopted in this final WRMP24.

The first sustainability reductions are profiled to occur from 2029-30 onwards, gradually rising to 122 Ml/d by 2050. This represents a significant reduction in our total deployable output which is 213 Ml/d in 2049/50. As a result, the final WRMP24 has a greater supply demand balance to solve, with Environmental Destination being the core driver for investment in our final WRMP24.

Appendix 5B (Section 2.2) details how the potential environmental destination scenarios have been developed and agreed with the Environment Agency. The Appendix also details the investigations and options appraisal which will be undertaken in between 2025 and 2035 to confirm these potential reductions and how risk will be managed (Section 3.2 of Appendix 5B). Section 4 of Appendix 5B provides an overview of timescales, with the short, medium and long term actions defined.

Appendix 5B also includes further information on nature and catchment based solutions, mitigation and timescales, which were key themes in the consultation regarding environmental destination and abstraction reductions.

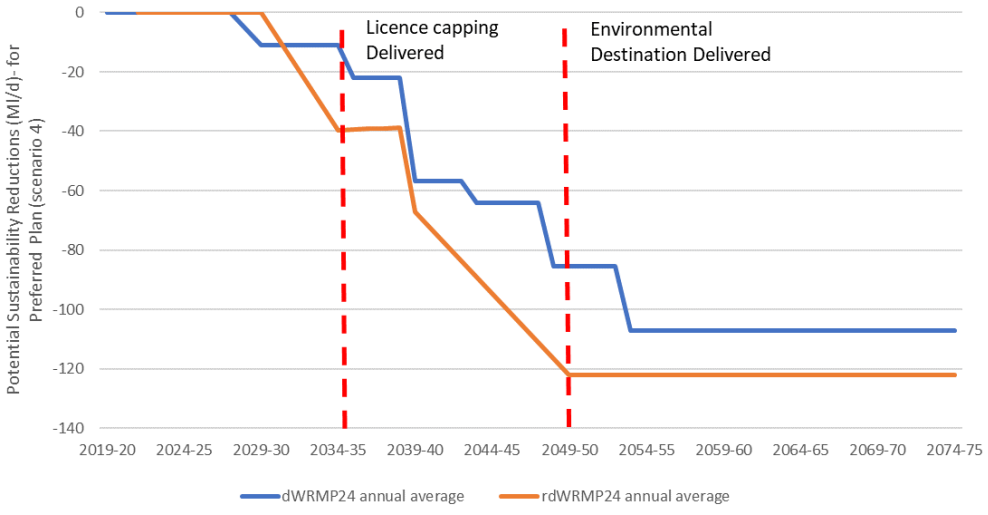


Figure 69: Comparison of the potential deployable sustainability reductions considered between the dWRMP24 and rdWRMP24

5.4.2 Drought Permits

Whilst drought permits are considered as an option in the WRMP, they are an aspect of our commitment to sustainable abstraction. In Appendix 5B we detail the assumptions in the WRMP24 regarding the use of drought permits (Section 2.3 of Appendix 5B) and the assessments and investigations we plan to undertake to ensure the use of drought permits is sustainable (Section 3.3 of Appendix 5B). In our WRMP24 we plan to remove the need for drought permits by 2040/41.

5.4.3 Time Limited Licence Variations

We have five time limited licence variations which expire on the 31/03/2028. Within our WRMP24 baseline we have assumed that these time limited variations are renewed. There is an interdependency between the renewal of these licenses and the findings of our catchment investigations, with the investigation findings providing evidence to support the renewal applications.

These licences are summarised in Table 31 which details the assumptions used in WRMP24. Overall, some variations increase abstraction in comparison to the non-time limited licence component (and therefore increase deployable output) and some reduce abstraction and/or water available for public water supply (and therefore reduce deployable output in comparison to the non-time limited licence).

We have accounted for the risk of time limited licences not being renewed via sensitivity analysis which assumes the time limited licence is not renewed. This is covered via supporting Appendix 9A.

We are committed to ensuring these time limited variations are sustainable and therefore within Section 3.4 of Appendix 5B we detail the planned investigations and assessments to confirm this.

Table 31: Summary of the time limited licence variations

Licence	Source	Variation	Influence on WRMP24
10/41/520101	Source U	Variation has a condition for an hourly abstraction rate of 126 cubic meters. The variation also reduces the daily and annual abstraction volumes from 4,545 and 1,363,636 to 3,024 and 1,103,760 cubic meters respectively. Furthermore the variation allows the source to be used for river augmentation purposes (River Ems).	Supply forecast uses the lower abstraction rate and continued river augmentation i.e. we assume renewal of the variation.
10/41/542108	QRST Group.	The variation allows for an increase in the aggregate daily licence quantity from 31,000 cubic meters a day to 41,000 cubic meters per day. The time limited variation does not alter the annual licenced quantity.	Supply forecast uses the higher abstraction rate i.e. we assume renewal of the variation.
11/42/25.2/50	Source C	Variation allows for abstraction from an additional borehole and increased daily abstraction rate from 28,000 to 31,500 cubic meters per day. There is no change in annual volume.	Supply forecast uses the higher abstraction rate i.e. we assume renewal of the variation.

11/42/28.3/15	Source F & G	Variation allows for abstraction from an additional borehole, but there is no change in daily abstraction or annual abstraction volumes. The variation also allows the source to be used for river augmentation (River Meon).	Assume use of the additional borehole is continued along with river augmentation i.e. we assume renewal of the variation.
SO/041/0027/004	Source N	The variation is for an augmentation into the River Ems at 13 litres second when river flows fall below 15 l/s and continue until natural flow exceeds 38 l/s. When augmentation is active, abstraction is halted from the source.	Supply forecast assumes a reduced public water supply due to augmentation i.e. we assume renewal of the variation.

5.5 Climate Change

The WRPG requires companies to assess the risk and possible impact of climate change on their supply systems and report the likely implications for deployable output. HR Wallingford have produced the 'Updated projections of future water availability for the third UK Climate Change Risk Assessment' which provides an update on future water availability for the UK under climate change[34]. The outcomes of this report highlight the significant risk posed by climate change to water resources in the UK, particularly in the South East. The report also highlights that 'without the actions already being taken by water companies, these zones would not be able to offer the level of resilience to drought specified by the current water resource plans', emphasising the need for continued assessment of the impact of climate change on our water resource system.

Our previous assessment for WRMP19 was based upon the UKCP09 dataset. This dataset has since been replaced with the UKCP18 projections. Data from UKCP18 provides the most up to date climate change projections available for the UK, using the best climate models from the UK and around the world. It provides several datasets which can be used by the water industry to determine the range of outcomes that climate change may result in. WRSE produced a method statement detailing how the impact of climate change on DO has been assessed using this UKCP18 dataset through the regional water resource model[35].

The WRSE method statement on assessing the potential impact of climate change follows the Environment Agency guidance to assessing climate change impact. This guidance follows the change in supply system resilience requirements to ensure systems are resilient up to a 1-in-500 year event.

Through WRSE, 28 different climate change scenarios were modelled, incorporating UKCP18 Regional Climate Model (RCM) and Global Climate Model (GCM) outputs. Since the dWRMP24 our climate change assessment has been revised. For the dWRMP24 a subset of 21 from the 400 stochastic replicates were selected by WRSE for use in the climate change assessment. For the final WRMP24 we have expanded this assessment to utilise all 400 stochastic replicates. Although the 21 replicates selected in the dWRMP24 were chosen such that a range of drought return periods were contained within them, there was a focus to ensure that droughts with magnitudes of between 1-in-100 year and 1-in-500 year return periods were included. Consequently, utilising the full 400 traces provides a more robust assessment of the impact of climate change, compared to the 21-trace subset, particularly at the 1-in-2 return period.

Climate change factors for precipitation and potential evapotranspiration for each of the 28 scenarios were available for key locations in the region. We applied the relevant factors to the baseline stochastic rainfall and potential evapotranspiration data to allow modelling of climate changed groundwater levels. Southern Water followed a similar process to model climate changed river flows in the River Itchen. These groundwater and surface water stochastic data sets were then applied within the joint Southern Water and Portsmouth Water Pywr model.

Utilising the full 400 stochastic traces for the WRMP24 allowed us to apply the 'Scottish' DO calculation method ensuring consistency across our baseline (Section 5.2.7) and climate change impact assessments. The Scottish method increments simulated demand across a number of demand steps and records the frequency of observed demand deficits, that is the volume of demand not met by available supply. Simulated demand was increased until

[34] https://www.ukclimaterisk.org/wp-content/uploads/2020/07/Updated-projections-of-future-water-availability_HRW.pdf

[35] Microsoft Word - WRSE_File_1335_WRSE MS Climate Change.docx (all WRSE documents can be located in the WRSE library: https://www.wrse.org.uk/library)

failures occurred at the required frequency to define the DYAA and DYCP DO at a range of return periods of interest; 1-in-500, 200, 100 and 2 years. These values were produced for each of the 28 climate models and were compared to the baseline DO to determine climate change impact.

The range of climate change impacts reflects the vulnerability of our system to potential future climate change. Across the 28 scenarios, where river flows and groundwater levels are increased as a result of climate change, then deployable outputs are forecast to be higher than the baseline. However, for the majority of the 28 scenarios there is reduced deployable output owing to lower river flows and groundwater levels.

Lower groundwater levels will result in reduced available flows from our key spring source (Source B). They can also restrict how much we take from boreholes and wells due to 'Deepest Advisable Pumping Water Levels' (e.g. Source J), linked to constraints such as major fissure zones. Where river flows are forecast to reduce, then we are more likely to reach 'Hands off Flow' constraints on the River Itchen, which impacts the amount of available surface water for abstraction.

The outputs from our Pywr model were processed directly by WRSE. This process occurred outside of the Pywr model and converted results into impacts on the DO at each of the key return periods.

5.5.1 Climate change DO assessment

The climate change DO impacts are linearly scaled from 1990 to 2070 and extrapolated beyond 2070 to provide a profile of climate change across the planning period.

Up to 2040, the median value of the 28 climate change DO impacts, in Ml/d, was included as the best estimate of climate change impacts in the baseline supply forecast. These are the 12 regional projections, the 3 global projections from the Hadley Model which were not run through the regional climate model, and the 13 global projections from the CMIP5 ensemble.

Up to 2040, the uncertainty in the climate change impact is incorporated within our target headroom profile. As described in our headroom assessment (Appendix 6A), for the 'S8' headroom component the uncertainty range was defined as a triangular distribution, with the minimum and maximum parameters being defined by the difference of the minimum and maximum values of the 28 climate change DO impacts, from the median value.

Beyond 2040 the uncertainty in the climate change impacts has been removed from our target headroom profile. Instead, the uncertainty is explored via the adaptive planning branches in the WRSE investment model (see Figure 34: 'Portsmouth Water's Adaptive Planning branches with the core pathway highlighted').

Three sets of climate change impacts were applied across the nine adaptive planning pathways beyond 2040. These represent plausible high, median and low climate change DO impacts. The impacts for the 2070s across a range of return periods are presented in Table 32. The scaled profiles of annual climate change impacts from 2040 for the 1-in-500 year return period are presented in Table 33.

The 'CC06' data represents the upper quartile of 28 UKCP18 climate change scenarios, resulting in a more challenging 'high' impact to the supply demand balance. The 'CC07' data represents the lower quartile of 28 UKCP18 climate change scenarios, resulting in a less challenging 'low' impact to the supply demand balance.

Table 32: Climate change impacts (2070s) for the three climate change scenarios used in adaptive pathways

Return Period	DYAA DO (Ml/d) Median values	DYCP DO (Ml/d) Median values	CC06 DYAA (Ml/d) Median values	CC06 DYCP (Ml/d) Median values	CC07 DYAA (Ml/d) Median values	CC07 DYCP (Ml/d) Median values
2	−0.9	−0.6	−1.9	−1.3	−1.9	−0.1
100	−12.05	−11.0	−17.2	−15.2	−14.4	−7.0
200	−7.4	−6.05	−14.4	−11.2	−6.2	−2.1
500	−6.05	−2.6	−12.9	−5.0	−1.7	−0.1]

Table 33: Scaled climate change impacts for the three climate change scenarios used in adaptive pathways (1 in 500 year return period)

Year	DYAA DO (Ml/d) Median impact	DYCP DO (Ml/d) Median impact	CC06 DYAA (Ml/d) High impact	CC06 DYCP (Ml/d) High impact	CC07 DYAA (Ml/d) Low impact	CC07 DYCP (Ml/d) Low impact	Uncertainty DYAA (Ml/d) High – Low Impact	Uncertainty DYCP (Ml/d) High – Low Impact
2039-40	-3.75	-1.62	-8.06	-3.11	-1.06	-0.06	7.00	3.05
2040-41	-3.83	-1.65	-8.22	-3.17	-1.08	-0.06	7.14	3.11
2041-42	-3.90	-1.68	-8.38	-3.23	-1.11	-0.06	7.27	3.17
2042-43	-3.98	-1.71	-8.54	-3.29	-1.13	-0.07	7.41	3.22
2043-44	-4.05	-1.74	-8.70	-3.35	-1.15	-0.07	7.55	3.28
2044-45	-4.13	-1.78	-8.86	-3.42	-1.17	-0.07	7.69	3.35
2045-46	-4.20	-1.81	-9.02	-3.48	-1.19	-0.07	7.83	3.41
2046-47	-4.28	-1.84	-9.18	-3.54	-1.21	-0.07	7.97	3.47
2047-48	-4.35	-1.87	-9.35	-3.60	-1.23	-0.07	8.12	3.53
2048-49	-4.43	-1.91	-9.51	-3.67	-1.25	-0.07	8.26	3.60
2049-50	-4.50	-1.94	-9.67	-3.73	-1.28	-0.08	8.39	3.65
2050-51	-4.58	-1.97	-9.83	-3.79	-1.30	-0.08	8.53	3.71
2051-52	-4.65	-2.00	-9.99	-3.85	-1.32	-0.08	8.67	3.77
2052-53	-4.73	-2.04	-10.15	-3.91	-1.34	-0.08	8.81	3.83
2053-54	-4.80	-2.07	-10.31	-3.98	-1.36	-0.08	8.95	3.90
2054-55	-4.88	-2.10	-10.47	-4.04	-1.38	-0.08	9.09	3.96
2055-56	-4.95	-2.13	-10.63	-4.10	-1.40	-0.08	9.23	4.02
2056-57	-5.03	-2.16	-10.80	-4.16	-1.42	-0.08	9.38	4.08
2057-58	-5.10	-2.20	-10.96	-4.22	-1.45	-0.09	9.51	4.13
2058-59	-5.18	-2.23	-11.12	-4.29	-1.47	-0.09	9.65	4.20
2059-60	-5.25	-2.26	-11.28	-4.35	-1.49	-0.09	9.79	4.26
2060-61	-5.33	-2.29	-11.44	-4.41	-1.51	-0.09	9.93	4.32
2061-62	-5.40	-2.33	-11.60	-4.47	-1.53	-0.09	10.07	4.38
2062-63	-5.48	-2.36	-11.76	-4.54	-1.55	-0.09	10.21	4.45
2063-64	-5.55	-2.39	-11.92	-4.60	-1.57	-0.09	10.35	4.51

2064-65	-5.63	-2.42	-12.08	-4.66	-1.59	-0.09	10.49	4.57
2065-66	-5.70	-2.46	-12.25	-4.72	-1.62	-0.10	10.63	4.62
2066-67	-5.78	-2.49	-12.41	-4.78	-1.64	-0.10	10.77	4.68
2067-68	-5.85	-2.52	-12.57	-4.85	-1.66	-0.10	10.91	4.75
2068-69	-5.93	-2.55	-12.73	-4.91	-1.68	-0.10	11.05	4.81
2069-70	-6.01	-2.59	-12.89	-4.97	-1.70	-0.10	11.19	4.87
2070-71	-6.08	-2.62	-13.05	-5.03	-1.72	-0.10	11.33	4.93
2071-72	-6.16	-2.65	-13.21	-5.09	-1.74	-0.10	11.47	4.99
2072-73	-6.23	-2.68	-13.37	-5.16	-1.76	-0.10	11.61	5.06
2073-74	-6.31	-2.71	-13.53	-5.22	-1.79	-0.11	11.74	5.11
2074-75	-6.38	-2.75	-13.70	-5.28	-1.81	-0.11	11.89	5.17

5.6 Outage assessment

Outage is defined as "*a temporary loss of deployable output at a source works*". It can relate to planned or unplanned events and covers a wide range of influences from power failure to short term pollution incidents.

5.6.1 WRMP19 outage assessment

This section details the outage method undertaken for the final WRMP19. This method was subsequently updated for WRMP24, in time to use in the Revised WRMP19 (Dec 2022) update.

Outage in WRMP19 was assessed using data from 2007–2016. We employed AECOM to undertake the outage assessment, which was completed in accordance with the relevant guidance:

- EA and NRW 'Water Resources Planning Guideline' (April 2017)
- UKWIR 'Outage allowances for water resources planning' (1995)
- UKWIR 'WRMP19 methods – risk-based planning' (2016).

Historical data were split into outage categories with magnitudes and durations recorded. A Monte Carlo simulation was then undertaken to simulate outage in the future, having justified which events are 'legitimate'. AECOM used a model called @ RISK to carry out the assessment. All Monte Carlo simulations undertaken for the WRMP19 outage assessment were run for 10,000 iterations to ensure consistent results.

Outage allowances for WRMP19 were calculated for three scenarios:

- Dry Year Annual Average (DYAA)
- Dry Year Critical Period (DYCP)
- Dry Year Minimum Deployable Output (DYMDO)

An assessment of the potential variations in outage was undertaken to take account for planned increases to our supply availability during the planning period. Future profiles of outage were determined using the same standard approach but with probability distributions based on the increased deployable output values applicable at each stage of the planning period.

The calculated outage values were for a probability of 95 per cent, or exceedance probability of 5 per cent. The results are presented in Table 34.

Table 34: Outage included in previous WRMP19 (Ml/d)

Period	DYAA		DCYP		DYMDO	
	Value in Ml/d	As % of DO	Value in Ml/d	As % of DO	Value in Ml/d	As % of DO
2018–19	13.0	5.7%	12.5	4.5%	14.2	5.7%
2019–20 – 2022–23	13.1	5.6%	12.5	4.4%	14.3	5.6%
2023–24 – 2028–29	13.5	5.5%	12.6	4.3%	14.7	5.5%
2029–30 – 2044–45	14.6	5.5%	15.4	4.5%	16.0	5.5%

5.6.2 WRMP24 outage methodology

WRSE have developed a method statement on the assessment of outage for this WRMP24 (see Appendix 5Aa). The methodology provides guidance on recording, processing, analysing and modelling outage events to ensure consistency between the companies in WRSE. WRSE also co-ordinated the development of an Outage Modelling Tool (OMT). The OMT is an excel-based tool developed to enable reporting and analysis for annual reporting to the Environment Agency, reporting to Ofwat for specifying performance against the unplanned outage, and for WRMP24 outage allowance determination.

All potential outages can be recorded in the OMT, with screening for legitimacy carried out within this tool. This ensures a clear and transparent audit trail for our outage allowance, with explanation for any variation between annual returns and outage allowances. The tool has also been developed to capture how capital investment has been accounted for and to explain any other adjustments to outage. The OMT provides a clear explanation for the scope of and limitations for any WRMP options to reduce outage.

We commissioned Mott MacDonald to undertake the outage assessment for this current WRMP using the OMT tool developed by WRSE. Since the dWRMP24 the outage assessment has been revised based on the updated Deployable Output assessment. As part of this review, Havant Thicket Reservoir has been included in the outage assessment which results in a 0.2 to 0.3 Ml/d increase in the outage allowance. This assessment is presented in Appendix 5Ab.

The assessment screened and processed outage event data in the OMT following the relevant guidance:

- 'Water Resources Planning Guideline' (December 2021)
- UKWIR 'Outage allowances for water resources planning' (1995)
- UKWIR 'WRMP19 methods – risk-based planning' (2016).

5.6.2.1 Assessment timescales

The most appropriate data record for determining the outage allowance is from April 2013 to October 2020. This period was selected as it provides a good balance between the length of data available and data quality.

5.6.2.2 Screening for legitimate outage events

The analysis of future outage is based on events that are considered to be 'legitimate'. Many of our recorded outage events are not legitimate outage events to assess a suitable outage allowance for the supply-demand balance. Event impacts were determined as the product of

magnitude and duration, and the highest impact events were selected for further investigation. Additional detail on the exclusion of outage events is provided in Appendix 5A.

5.6.3 WRMP24 outage results

Our outage assessment has generated the following results for DYAA, DYCP and DYMDO. Havant Thicket Reservoir has been included in the outage assessment onwards which results in a 0.2 to 0.3 Ml/d increase in the outage allowance. Results are presented for a 90 per cent probability for the 1-in-200 return period in Table 35. Results for additional probabilities and for the 1-in-500 return period are presented in Appendix 5Ab.

Table 35: DYAA, DYCP and DYMDO outage allowances for WRMP24 (Ml/d), 1-in-200 return period.

Scenario	Monte Carlo P90 Ml/d (Havant Thicket Excluded)	Monte Carlo P90 Ml/d (Havant Thicket Included)
DYAA	6.6	6.8
DYCP	6.6	6.9
DYMDO	4.6	4.6

The revised outage allowance is lower than the allowance in the published Final WRMP19 for the following reasons:

- All long duration events were capped at 90 days.
- Events were separated into long and short duration events, with specific probability distributions for both. This prevented the skewing of duration distributions, which artificially increases the outage allowance.
- The choice of distributions used were reviewed for all site/hazard combinations with a contribution to outage >0.2 Ml/d.
- Length of data record used in the assessment was also reviewed. To balance data quality with capturing a sufficient period of data, the record from 2013 to 2020 has been used for the revised assessment to determine the outage allowance.

Outage has been assessed for each works. The figures are not cumulative as outage events will not occur at all sites at the same time. The main contributory factors to our outage allowance are those of chlorine failures and pollution events.

Event durations of chlorine failures were historically longer on average, when compared to other companies, as we did not have a remote or automatic restart following system shutdown events. A physical site visit was required to inspect and verify failure reasons before restarting supply. In the past 12 months we are implementing a new control room system that allows remote start-up, leading to a reduction in outages related to chlorine failures. Although this may help reduce our outage allowance in the future, the impact cannot be quantified until more data has been collected.

Pollution events have also had a significant impact on the outage allowance. In the past our sites were shut down for longer durations as a precaution. Newly installed VOC monitors are likely to reduce the outage durations of any future pollution events related to oil spills, although similar to chlorine failures, the impact cannot be quantified until further data is collected.

Within Appendix 5Ab Mott MacDonald provided future recommendations for outage recording. Since the dWRMP24 we have responded to these recommendations which are

presented within the Annex of Appendix 5Ab. This includes a commitment to improve the future recording of outages.

5.7 Process losses

Process losses (as shown in Table 36) occur between the point of abstraction and the point at which water enters the supply network and account for the loss of water during the treatment process. Losses can occur at both groundwater and surface water sources. Groundwater sources usually require a simpler treatment process relative to surface water sources and consequently groundwater losses are often treated as negligible. We have two works with full conventional treatment and three works with membranes for Cryptosporidium removal. At two works there is a compensation water condition in the licence, but this raw water loss is not included in process losses.

In general, complex treatment works such as Treatment Works A have losses of around 5 per cent of DO. At Treatment Works B, membrane filters have now been replaced with a UV treatment plant and losses have fallen to less than one per cent.

Table 36: Process Losses for the DYAA and DYCP planning scenarios

Source Works	Treatment	Average (Ml/d)	Peak (Ml/d)
Treatment Works A	Complex	1.9	1.9
Treatment Works B	Complex	0.2	0.2
Source F	Membrane	0.1	0.1
Source K	Membrane	0.1	0.1
Source P	Membrane	0.1	0.1
Total		2.4	2.4

We do not include treatment works losses in the calculation of DO. Treatment works losses and raw water losses are entered as separate lines in the WRMP24 tables. The tables then combine these entries to give the overall process loss.

The River Ems augmentation flow has been removed from the process losses because it has been provided by raw water since 2016. The augmentation is provided by Source U which has been removed from the overall DO assessment.

5.8 Environment and Drinking Water Quality

Our catchments, whether they are rivers, seas or underground aquifers, are affected by everyone and everything using them. High nitrate levels in rivers or groundwater may come from a number of sources – fertiliser applications, old or poorly maintained septic tanks, leaking sewers, wastewater discharges and manure storage and spreading.

At high levels, nitrate affects water bodies, including estuaries and coastal waters, by causing large amounts of algae to grow. This reduces the amount of oxygen in the water which impacts aquatic plants and wildlife. There are also standards for the level of nitrate allowed in drinking water. Two thirds of our groundwater sources show high or increasing levels of nitrate, which need to be reduced to meet these standards. We can do this by adding additional treatment or diluting the concentration by mixing water with supplies from another source with lower levels. Either way, this involves 'building' a solution which is expensive, energy intensive, and not sustainable in the long term.

So alongside these solutions, we're working with our partners such as Catchment Sensitive Farming to address the sources of nitrate in our catchments. This means we are protecting both our drinking water sources and the natural environment for the future. It can take decades for water to seep down into aquifers and the current levels of nitrate are from fertiliser used many years ago. This makes it even more important to take action now to prevent greater problems in the future, which is why we are committing to a long-term catchment management programme.

As well as the key challenges posed by nitrate and pesticides, we need to be ready to deal with any pollution incidents which have the potential to pose a risk to drinking water quality. We work in our catchment identifying and addressing potential hazards to try to prevent pollution incidents from occurring. For instance, we run an oil care campaign offering advice and incentives for heating oil tank inspections and replacements where they are deemed to be unsafe and pose a risk of leaking.

In our Business Plan for PR24 (2025-2030), we are proposing to continue our Drinking Water Protected Area schemes to deliver incentives to farmers in the form of funding for Payment Ecosystem Services (PES) and capital grants. These funds support measures to reduce nitrate leaching by enhancing nitrate precision farming such as planting cover crops and helping to fund nitrate precision fertilizer spreaders. We are also including options that address risks that nitrate pose to drinking water quality. Recent assessments have shown that Nitrate Treatment Plants and increased blending solutions are needed at some of our sites. These options are being put forward into our business plan.

The main water quality impacts that are seen within abstraction water quality monitoring are nitrate levels. Nitrate trend assessments undertaken in AMP6 and updated in AMP7 show 11 abstractions to have deteriorating nitrate levels and in some cases, seasonal "spikes" that go above the drinking water standard (50mg/l). These abstractions have been designated as Safe Guard Zones by the Environment Agency (AMP6). The Water Framework Directive (WFD) requires water companies to reduce water quality impacts and these Safe Guard Zones were put forward in the AMP7 WINEP programme with detailed schemes to reduce water quality issues (agreed Measure Specification Forms with the Environment Agency). The Measure Specification Forms for the 11 Safe Guard Zones provide detailed actions and measures to reduce nitrate levels in groundwater.

It has been agreed with Ofwat and the Environment Agency that 5-year WINEP schemes to tackle nitrate levels is insufficient, and so they have supported the extension of these schemes into AMP8 & AMP9.

These Measure Specification Forms (MSFs) have short and long term actions and deliverable timescales which have been agreed with the Environment Agency. In AMP8, the MSFs will be amended to Action Specification Forms (ASFs) and are likely to have similar measures to reduce nitrate impacts.

We are committed to reducing the effects of INNS on our operations and the environment. For PR24 we are seeking funding for the continuation of our INNS programme. This includes managing our site at Source A and continuation of Portsmouth Water's 'Biodiversity Grant Scheme' to support third parties who wish to bid for funding to investigate and eradicate INNS in the Portsmouth Water Supply area. No options have been included in WRMP24 as the INNS schemes do not have a direct Deployable Output Benefit. New supply options considered for WRMP24 have been assessed against potential INNS risks to ensure there is no increase in INNS risk resulting from future operations. The INNS programme will be delivered via our PR24 WINEP (action ID 08PW100008).

5.9 Water available for use

The supplies used to assess against demand and uncertainty reflect the "water available for use" (WAFU) - which effectively shows the water available from our own sources (DO minus any DO reductions, outage and process losses), and account for any exports. WAFU also accounts for Environmental Destination (including licence capping) and sustainability reductions. Table 37 presents the WAFU for the reported pathway / situation 4 under DYAA conditions for 2024–2025 until 2074–2075. This demonstrates a significant reduction in water available for use over the planning period, primarily driven by Environmental Destination.

The WAFU is slightly lower in this final WRMP24 compared with that in the rdWRMP24. This is owing to the inclusion of NAV WRMP contractual volumes within the bulk supplies figures.

Table 37: Water Available for Use summary table for pathway / situation 4 under DYAA conditions

	2025–26	2029–30	2034–35	2039–40	2044–45	2049–50	2074–75
Deployable Output	193.4	193.4	213.4	213.4	213.4	213.4	213.4
Bulk Supplies	-32.1	-2.1	-2.1	-2.1	-2.1	-2.1	-2.1
Environmental Destination	0.0	0.0	-39.6	-67.1	-94.7	-122.2	-122.2
Climate Change	-2.7	-3.0	-3.4	-8.1	-8.9	-9.7	-13.7
Outage	-6.6	-6.8	-6.8	-6.6	-6.6	-6.6	-6.6
Process Losses	-2.4	-2.4	-2.4	-2.4	-2.4	-2.4	-2.4
Water Available for Use	**149.6**	**179.1**	**159.2**	**127.1**	**98.8**	**70.4**	**66.4**

Figure 70 illustrates the water available for use in our WRZ across the future scenarios. The plot highlights the adverse, moderate and benign scenarios as described in Section 2. Only three scenarios are plotted as 'growth' which does not affect the water available for use; it instead affects the demand element of the supply-demand balance. Additionally, the pairings of proposed environmental destination and climate change are consistent across the growth scenarios, i.e. medium environmental destination is always paired with median climate change impact and so forth.

Within the scenarios shown in Figure 70:

- The adverse scenarios capture adaptive pathways / situations 1, 4 & 7,
- the moderate scenarios capture pathways / situations 2, 5 & 8, and
- the benign scenarios capture pathways / situations 3, 6 & 9.

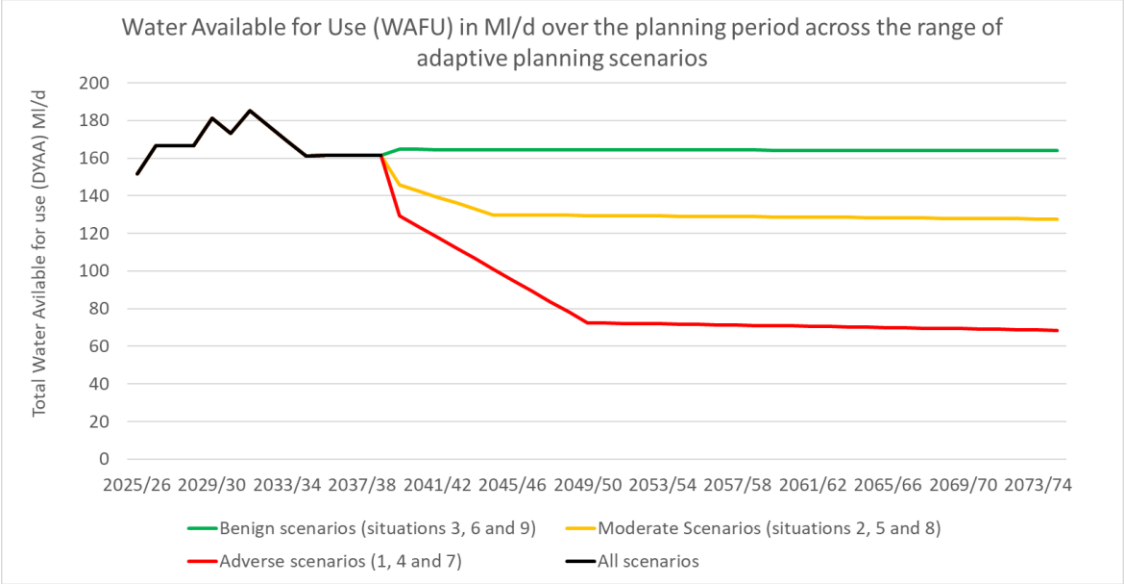


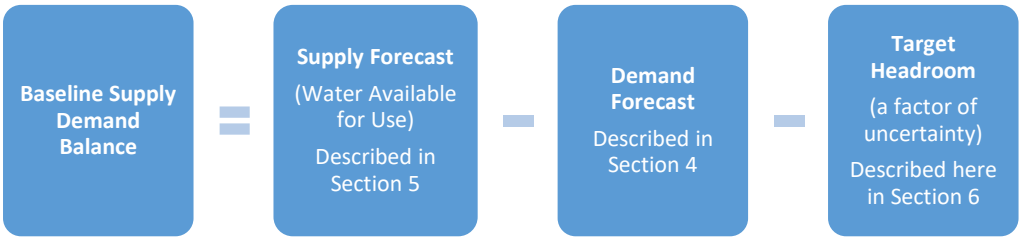
Figure 70: Water Available for Use across the planning scenarios from 2020 to 2075.

6 SUPPLY DEMAND BALANCE

The baseline position for the supply demand balance is a forecast of what would happen if we did not take any new supply or demand actions and did not implement any changes in company policy or existing operations. The baseline supply forecast includes the water available for use from current sources under the design drought scenario. It also includes the Havant Thicket Reservoir scheme approved under WRMP19, and currently under construction.

Our baseline supply demand forecast is based on supply, demand and headroom forecast information for our water resource zone. It has been calculated using consistent assumptions across the South East regional planning area.

The baseline supply demand balance compares our baseline supply forecast (defined as WAFU) with the baseline demand. The baseline position is based on the dry year annual average (for demand) and a design drought (for supply). Our agreements with Southern Water to provide bulk supplies are also included.



The amount of water needed in the future for public water supply (water provided by water companies) is being driven by four main challenges which will mean either less water is available for us to use or more water is needed. They are:

Drought resilience – more water needs to be made available so our supplies last longer during severe drought events, those that occur once in every 500 years, so emergency measures are less likely to be needed.

Population growth – an increase in population means more water is needed to supply customers and businesses.

Climate change – will reduce how much water is available from our water sources and when it is available, droughts will also become more common.

Environmental protection and improvement – we need to leave more water in the environment, reducing how much water we can take from some of our existing sources.

The WRMP24 tables that show the components used for the supply-demand balance have been prepared for both Annual Average and Critical Period scenarios.

6.1 Baseline assumptions for supply and demand

We have planned in line with the Government's National Water Resources Framework and the WRPG so that our system becomes resilient to a 0.2 per cent annual chance of implementing an emergency drought order because of drought conditions by 2039. This can also be described as '1-in-500-year' level of drought resilience.

Since the draft plan we have changed how we account for the 1-in-500 level of resilience in the planning tables based on regulator feedback, which is:

- We assume a 1-in-500 level of resilience from year 1 (2025-26) to year 50 (2074-75) of the planning period.
- Between years 1 (2025-26) and year 14 (2038-39) we implement an 'option' which effectively changes the levels of service from a 1-in-500 to a 1-in-200. This option effectively increases our deployable output.
- Between years 15 (2039-40) and year 50 (2074-75) we operate to a 1-in-500 level of resilience. The option selected between years 1 and 14 ceases, this in turn reduces our deployable output.

Planning for more extreme droughts than before also helps us to end our reliance on supply-side drought permits and orders by planning to deliver a reliable water supply in both normal and drought years.

In practical terms, we have built this resilience into our plan by forecasting based on the supplies we would have available in a 1-in-500 year drought situation, and demand as it is estimated to be in a dry weather year just before the point at which drought restrictions are implemented (this is referred to as 'unconstrained' demand).

The baseline demand forecast covers what people and businesses need, together with anticipated losses through leakage and operation. Our baseline assumption is that leakage is maintained at current levels and existing metering policies continue.

A 'Target Headroom' allowance is also included in the supply demand balance to account for the uncertainties within both the supply and the demand forecasts. Our approach to Target Headroom has been revised compared to previous planning cycles to avoid double counting uncertainties that are already allowed for in other areas of our adaptive planning.

6.2 Adaptive planning scenarios

Our adaptive planning approach is based on the development of pathways reflecting alternative investment plans, based around differing but plausible forecasts for population growth, environmental destination (sustainability reductions) and climate change.

The forecasts are produced in line with each of these pathways, which are described in greater detail in Section 2, and help us to predict future water needs. However, the further ahead we look the more uncertain the future is. We are taking an adaptive planning approach to help inform the right investment decisions and provide resilient water supplies to customers in the years ahead.

The supply-demand balance for the reported pathway (also referred to as 'Situation 4') is presented in the WRMP24 tables. This pathway has been central to the development of the preferred best value plan, with other pathways / situations being used to stress test the suitability of the plan to adapt to whichever of these plausible futures turns out to be closest to the actual future. This includes the Ofwat core pathway ('Situation 8'), which is the focus of our business planning and long term delivery strategy.

6.3 Target Headroom

6.3.1 Portsmouth Water target headroom assessment

The UKWIR 2002 guidance (An Improved methodology for assessing headroom – Report Ref No. 02/WR/13/2) defines Target Headroom as,

> *"… the minimum buffer that a prudent water company should allow between supply and demand to cater for specified uncertainties (except for those due to outages) in the overall supply demand balance"*

Through the target headroom allowance, risk and uncertainty is translated into an appropriate water resource planning margin. In determining target headroom, we considered the appropriate level of risk for our plan. We do this considering both:

- the accuracy of the planning assumptions (associated with measurements and modelling), as well as
- the range of potential future forecasts (uncertainty around longer-term influences such as climate change or changes in demographics).

If target headroom is too large it may drive unnecessary expenditure. If it is too small, the risk is that we may not be able to meet our planned level of service. An industry accepted methodology (An Improved Methodology for Assessing Headroom, WR-13. UKWIR Report 02/WR/13/2, 2002) sets out the required approach and methodology for calculating headroom uncertainty from which a chosen percentile is used to give target headroom. The WRPG requires annual forecast values of target headroom for the baseline and final plan in the rdWRMP24 tables.

The evolving methods and data used to plan water resources across the sector mean that some of the risk that has historically been accounted for in target headroom is now accounted for across several other parts of the plan, such as the adaptive planning situations, and application of 1-in-500 year supply forecast. In practical terms this means that the application of past approaches to calculating target headroom could lead to double counting of uncertainty in the context of this WRMP24.

There are several reasons why this WRMP24 contains less associated risk than previous plans, including the following:

- New analytical techniques mean that long-term water resource planning can be based on improved characterisation of the duration and severity of drought events. One example of this is the significantly longer stochastic sequences of plausible hydrometric data can be used to improve the characterisation of drought events (including their frequency) that are more severe than those in the historic record.
- New estimates of the impacts of climate change on hydrological data sets are now available.
- We have taken a fully collaborative regional approach to planning through the WRSE Alliance.
- Regulatory guidelines ask us to use ‘Plan-based’ property numbers in the central demand forecast despite Local Authority housing plans having historically over forecasted future housing numbers.
- Increased resilience to increasingly severe drought events.
- An adaptive planning approach has been used for decision-making based on multiple plausible versions of what the future might look like. The adaptive planning approach takes account of some of the uncertainty arising from a range of supply demand balance forecasts.

We have adopted a regionally consistent adaption of the UKWIR 2002 methodology. This approach adjusts the components used in the calculation of headroom uncertainty to prevent double counting of uncertainty within the adaptive planning approach.

The headroom calculation has been refreshed since the draft plan. The detailed methodology and results are detailed in Appendix 6A which has been completely refreshed.

Between the dWRMP24 and rdWRMP24, the target headroom assessment was revised to remove the impact of Covid-19 on demand. This had been included in target headroom as a one-sided risk for the dWRMP24 because the dWRMP24 baseline demand used pre-

pandemic demand data. For the rdWRMP24 the demand forecast base year was revised to 2021-22 which means baseline demand now reflects the impact of Covid-19 on demand.

Whilst the main impact of Covid-19 is now reflected in the baseline demand instead of target headroom, the target headroom assessment still includes a Covid-19 component to reflect a degree of uncertainty in future impacts.

The results of the assessment are summarised below in Figure 71 and Table 38.

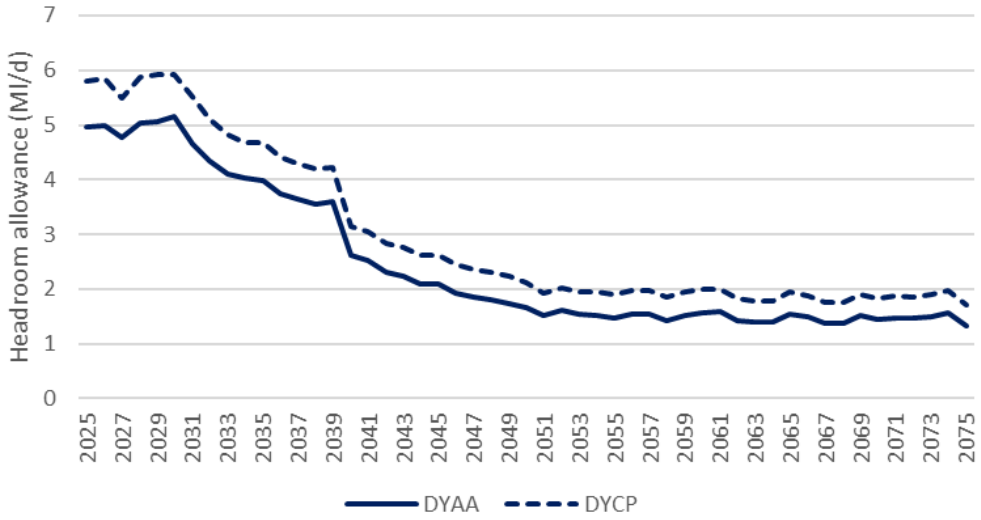


Figure 71: Target headroom profiles for dry year annual average (DYAA) and dry year critical period (DYCP) planning scenarios

Table 38: Summary of target headroom allowances, 2025 – 2075

Year	Combined Company Target Headroom Allowance, Ml/d	
	Dry Year Annual Average	Dry Year Critical Period
2025/26	4.98	5.86
2030/31	4.65	5.51
2035/36	3.74	4.41
2040/41	2.52	3.05
2045/46	1.93	2.44
2050/51	1.51	1.92
2055/56	1.54	1.97
2060/61	1.59	2.01
2065/66	1.49	1.89
2070/71	1.47	1.87
2074/75	1.32	1.72

6.3.2 Target headroom adjustments for New Appointments and Variations

The values in our rdWRMP24 headroom assessment, described in the section above, have been adjusted further for this final WRMP24 to consciously recognise our supply relationship with the three NAVs who supply water in our supply region.

Our consideration of NAV bulk supplies and demand forecasts is described within Section 5.3.5. For existing NAV sites incorporated within NAV WRMPs, and as part of our final WRMP24 updates, we have:

- Incorporated the NAV WRMP contractual volumes into our WRMP24 tables.
- Removed the known NAV WRMP growth in population, properties and demand (beyond 2021-22) from our own demand forecast.

These actions initially led to small deficits within our supply demand balance. This is because, whilst contractual volumes are added to our WRMP24 Table 3 in the year they were agreed, it can take many years before all the properties are built and populated, resulting in significant headroom in the supply demand balance of the NAV WRMP.

Furthermore, the NAV WRMPs include a target headroom, which results in double counting with respect to our own target headroom assessment described above.

To ensure there is no double counting of risk and uncertainty, we have reduced our own target headroom. This restores the supply demand balance within our final WRMP24 tables.

We will continue to engage with NAVs and our regulators to ensure that we can demonstrate alignment with NAV WRMPs in WRMP 2029.

6.4 Supply demand balance for adaptive scenarios

In all nine adaptive situations, our baseline supply demand balance starts in deficit and remains in deficit over the planning period. This is because drought interventions that are available to us in drought events of 1-in-200 year or more severe events are not included in the baseline. Instead, they are treated as options that the WRSE investment model can select.

During a dry year, the supply demand balance is more challenging for the DYAA scenario than under DYCP conditions. This being the case, the DYAA planning condition drives our investment need, and has been used as the basis for modelling the best value plan.

On the supply side, our chief vulnerability is our reliance upon chalk aquifers. The scale and timing of the Environmental Destination (with licence capping) is a significant driver of investment and remains a major uncertainty (please see Section 5.4).

The move to increase resilience from a 1-in-200 to a 1-in-500 year drought event in 2038-2039, combined with the high climate change and high environmental destination scenario, produces a noticeable step change in the balance between supply and demand for five of the nine scenarios in DYAA conditions.

This is summarised in Figure 72 and Figure 73 and Table 39.

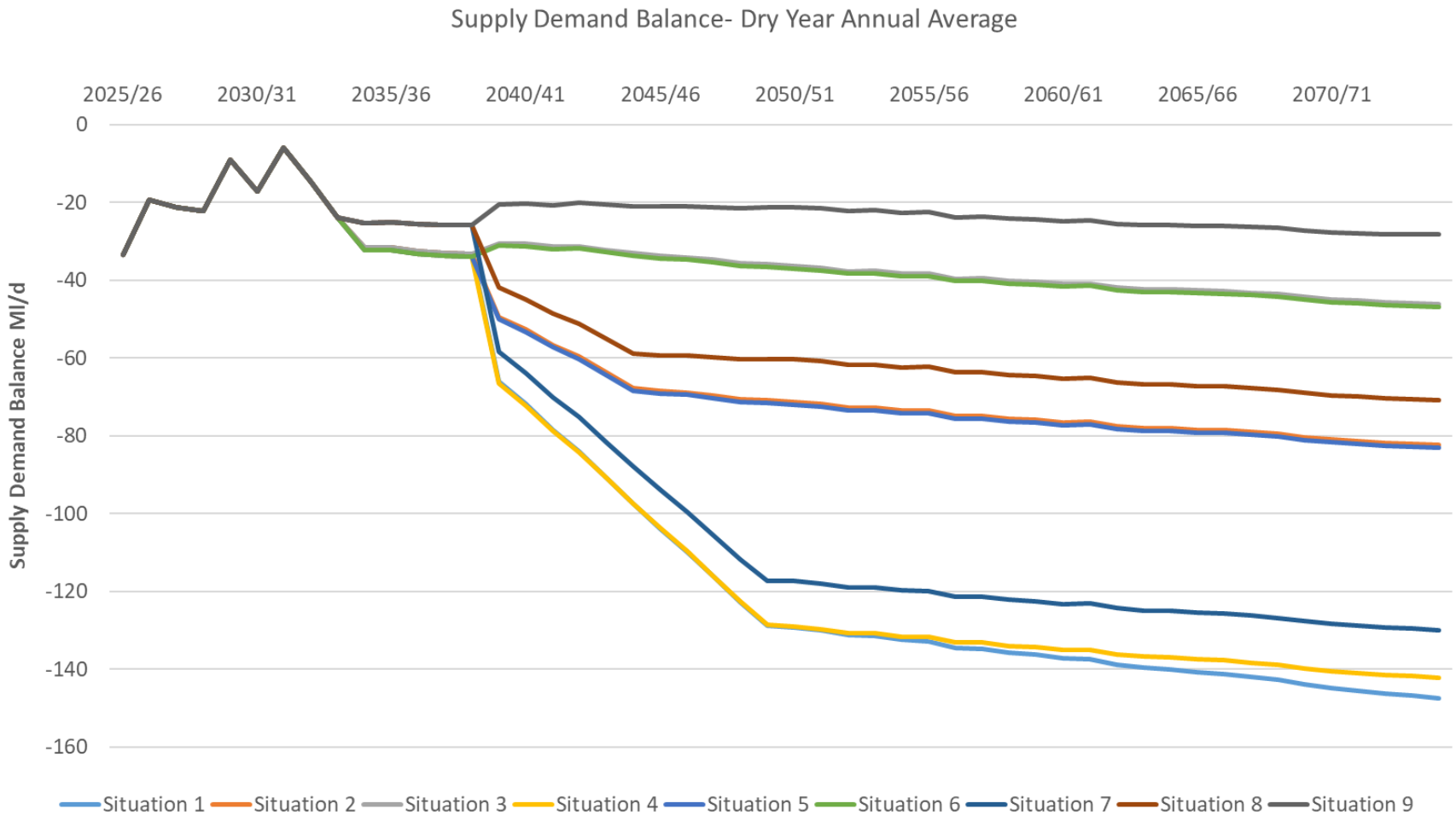


Figure 72: Baseline Supply Demand Balance (shown in Ml/d) for each of the nine adaptive planning Situations in the WRSE investment model (in dry year annual average conditions)

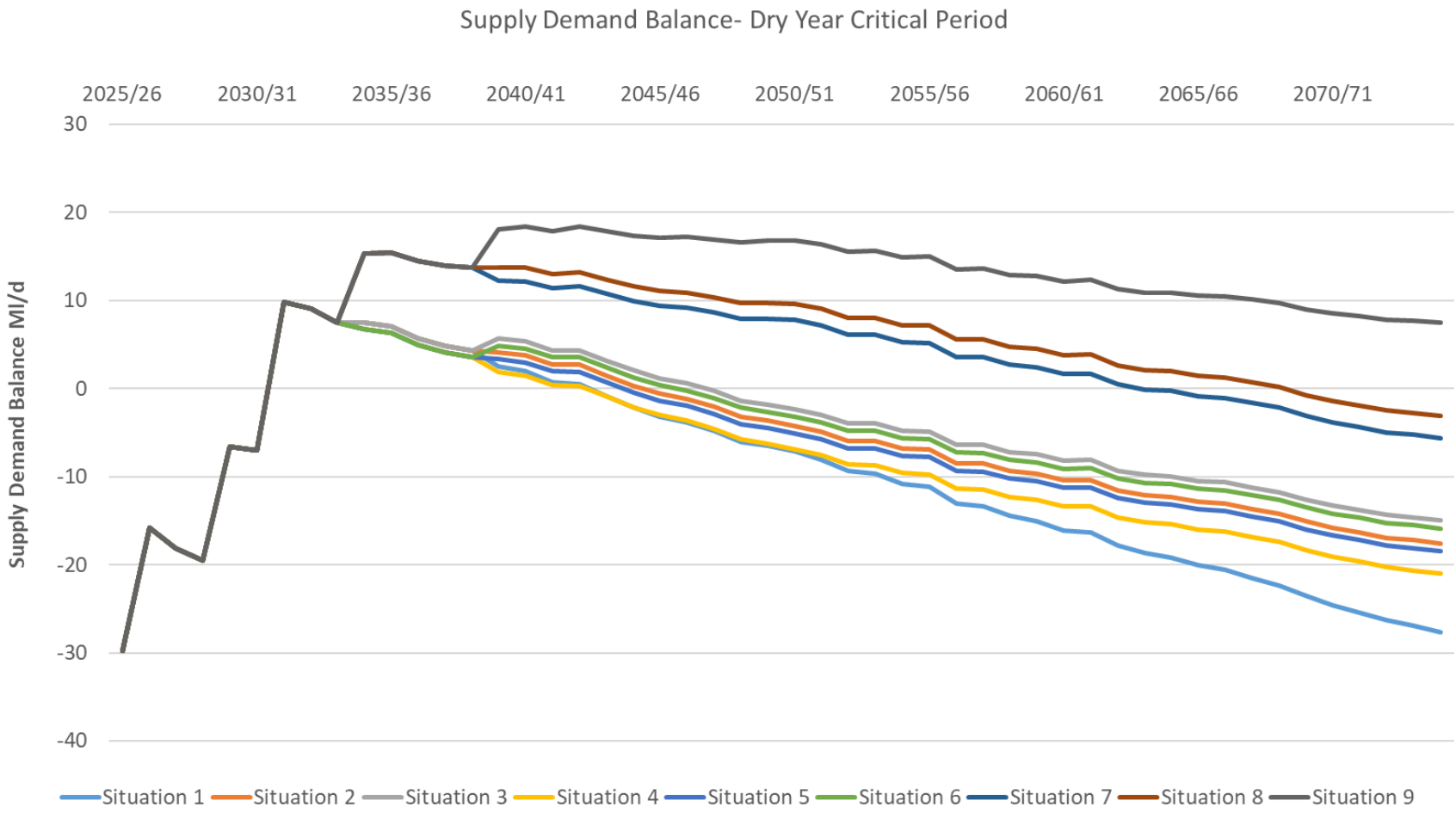


Figure 73: Baseline Supply Demand Balance (shown in Ml/d) for each of the nine adaptive planning Situations in the WRSE investment model (in dry year critical period conditions)

Table 39: Supply demand balance for each of the nine adaptive planning situations in the WRSE investment model (for the dry year annual average condition)

	2025/26	2029/30	2034/35	2039/40	2044/45	2049/50	2059/60	2074/75
Situation 1	-32.78	-9.61	-32.14	-66.51	-97.93	-129.26	-136.81	-147.93
Situation 2	-32.78	-9.61	-32.14	-50.02	-68.26	-71.41	-76.34	-82.87
Situation 3	-32.78	-9.61	-32.14	-31.03	-33.60	-36.48	-40.87	-46.58
Situation 4	-32.78	-9.61	-32.71	-67.06	-97.91	-129.06	-134.87	-142.71
Situation 5	-32.78	-9.61	-32.71	-50.62	-68.90	-72.07	-77.02	-83.58
Situation 6	-32.78	-9.61	-32.71	-31.63	-34.24	-37.14	-41.55	-47.29
Situation 7	-32.78	-9.61	-25.89	-58.83	-88.35	-117.80	-122.98	-130.52
Situation 8	-32.78	-9.61	-25.89	-42.39	-59.34	-60.81	-65.13	-71.39
Situation 9	-32.78	-9.61	-25.89	-21.14	-21.48	-21.72	-24.81	-28.80

6.5 Supply demand balance for the reported core pathway

Adaptive planning pathway 4 (also referred to as 'Situation 4') is our reported pathway for this WRMP24. The eight alternative pathways cover the full range of scenarios between 2025 and 2075, including the Ofwat core pathway ('Situation 8'). Each pathway is equally likely.

Our reported pathway is adopted from the WRSE draft regional plan reported pathway and informed by an update from regulators setting out their preference for pathway / situation 4. This is the pathway that we have used to identify the investment programme for our draft best value regional plan and our final WRMP24. We have also identified the investment that would be needed in the alternative pathways.

Our reported pathway meets the regulatory guidance. It uses growth scenarios that are compliant with regulatory guidance, incorporates climate change impacts and an environmental destination preferred by Natural England and the Environment Agency. Critically, it includes all activities that need to be undertaken to be ready for all plausible future scenarios.

From 2040, there are eight alternative pathways to the reported pathway, each with a different combination of environmental improvement, climate change and population growth scenarios. This allows us to look ahead at the full range of possible futures that we may experience and the schemes that we would need to progress.

If we experience a different future scenario to our reported pathway, we will be able to move to an alternative pathway. We have included decision points where we will decide if we need to change course. If we do, there will then be a branching point to move to the appropriate pathway.

There are three main factors that would require us to change pathway:

Population growth - This will impact future demand for water. We have included a decision point in 2030 where we will assess whether the growth in population and the updated population forecasts are in line with our reported pathway. If it is either above or below our assumption, we will move to an alternative pathway with alternative investment requirements.

Environmental improvement - The level of abstraction reduction will impact how much water is available to supply. We have included a decision point in 2035 following the completion of the environmental investigations that will take place from 2025 via the WINEP. These will determine how much water companies will need to reduce their abstractions by to deliver environmental improvement by 2050. If this differs to our reported pathway, we will move to the appropriate pathway in 2040.

Climate change - The impact of climate change will also affect how much water is available to supply. Again, we may need to move to an appropriate alternative pathway in 2040.

The regional plan will be updated every five years to inform the water companies' future WRMPs. The trigger points we have included align with the completion of the five-year business plans that should include the investment needed for the pathway we are following.

Since the dWRMP24 we have produced a monitoring plan which will enable us to monitor and track which situation or alternative future is emerging. Please refer to Appendix 10A.

The baseline supply demand balance for our reported pathway is provided in Table 40.

Table 40: Baseline supply demand balance for our reported pathway (situation 4) for dry year annual average (DYAA) condition

Year	2025–26	2029–30	2034–35	2039–40	2044–45	2049–50	2059–60	2074–75
Supply in Ml/d WRP 11BL	149.61	179.11	159.15	127.12	98.77	70.41	68.80	66.39
Demand in Ml/d WRP 45BL	179.48	184.20	188.38	192.09	195.13	198.35	202.64	208.32
Target headroom in Ml/d WRP 48BL	4.21	5.15	3.52	2.18	1.68	1.28	1.18	0.93
Supply Demand Balance in Ml/d WRP 50BL	-34.08	-10.24	-32.75	-67.15	-98.04	-129.22	-135.02	-142.86

Figure 74 provides a visualisation of the additional water required over the planning period resulting from Environmental Destination (abstraction reductions), population growth, climate change and drought resilience.

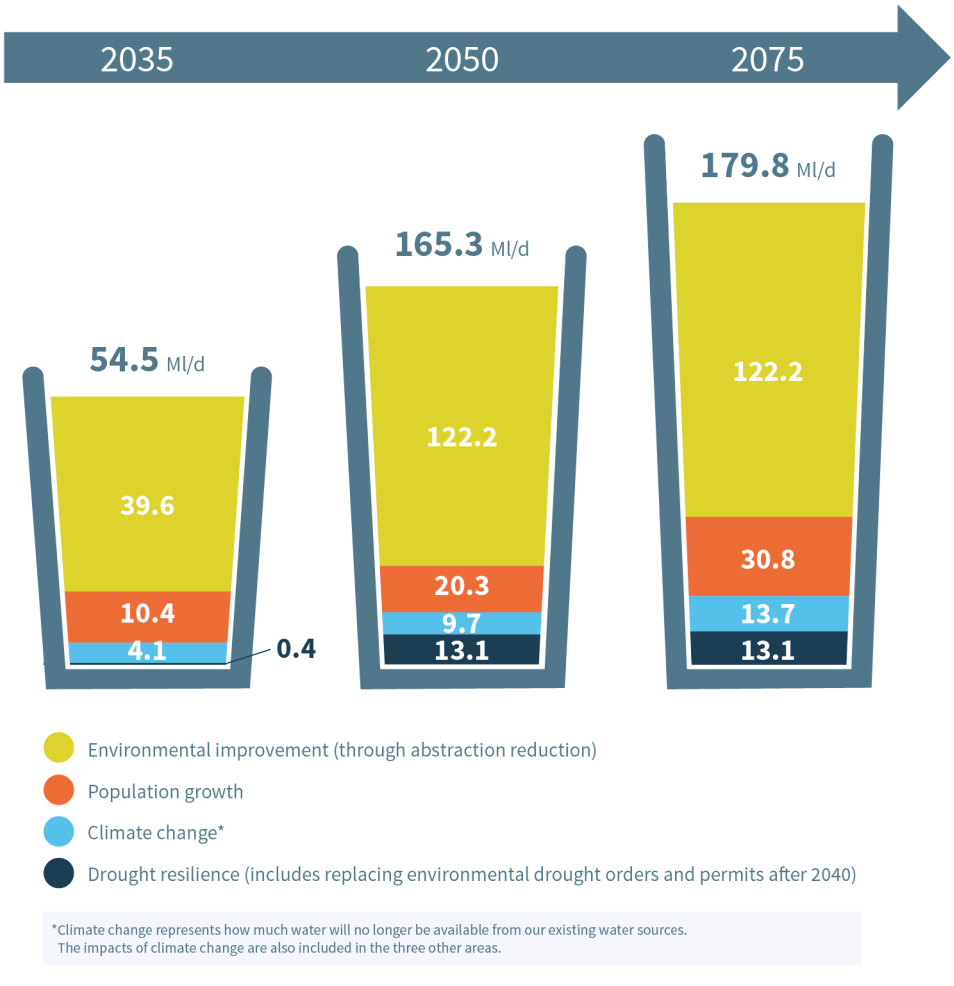


Figure 74: Visual presentation of the additional water required over the planning period

6.6 Comparison with WRMP19

It is not possible to make a meaningful comparison between the baseline supply-demand balances for our revised WRMP19 and WRMP24. This is because in the WRMP24 Havant Thicket is part of our baseline unlike in the revised WRMP19. Furthermore, in the WRMP24 the existing bulk supplies to Southern Water are only treated as baseline until contract renewal dates (instead of being included in the baseline throughout the planning horizon). Significantly, the revised WRMP19 also assumes no sustainability reductions, whereas the WRMP24 includes potential sustainability reductions associated with environmental destination (with licence capping). However, we have provided the following comparison from WRMP19 (2025/26 Final Plan) and WRMP24 (2025/26) in Table 41. For clarity, the comparison is against the Revised WRMP19 (Dec 2022) as this reflects our latest published WRMP19.

Table 41: Comparison of the supply demand balance between WRMP19 2025/26 Final Plan (FP) and WRMP24 2025/26 Baseline (BL)

Key component	WRMP19 (FP) 2025/26 (Ml/d)	WRMP24 (BL) 2025/26 (Ml/d)	Difference (Ml/d)	Explanation for differences
Company Supply Demand Balance	2.27	-34.08	-36.35	Differences due to items below.
Deployable Output	226.72	193.41	-33.3	WRMP19 FP includes 16.60 Ml/d for demand side drought orders; 3.6 Ml/d for supply side drought permit; -0.28 Ml/d climate change. These items are excluded from the WRMP24 baseline. As detailed in Section 5 we have undertaken updated deployable output modelling. The WRMP24 baseline DO reflects a 1-in-500 deployable output, whereas WRMP19 it reflects a 1-in-200.
Climate change impact	-0.28	-2.70	-2.4	Different climate change impact assessment approach for WRMP24
Sustainability Reductions (WINEP/ Licence capping)	0	0	0	N/A
Environmental Destination	0	0	0	N/A
1-in-500 resilience impact	0	0	0	Captured in Deployable Output
Household demand	123.59 (54.82 + 68.77)	134.98 (45.23 + 89.75)	11.39	WRMP24 now includes the effects of Covid-19 in baseline demand. Covid-19 also hindered our water efficiency support. The WRMP24 forecast has also removed NAV WRMP growth to avoid double counting.
Non-household demand	32.29 (31.71 + 0.58)	30.59 (29.93 + 0.66)	-1.70	Updated non-household demand forecast (see Section 4). The WRMP24 forecast has also removed NAV WRMP growth to avoid double counting.
Target Headroom	4.81	4.21	0.60	Headroom revised for WRMP24. See Section 6.3.
Outage	6.7	6.60	-0.10	Revised assessment for WRMP24
Process losses	2.4	2.4	0.00	No change
Distribution Input	171.54	180.21	8.67	Combined demand changes.

6.6.1 PR19 Performance Commitments, AMP7 Schemes and WRMP24 starting position

We recognise the importance of delivering our remaining AMP7 schemes to ensure a healthy starting position for WRMP24. For WRMP19 we had a selection of Supply and Demand Options to be implemented over AMP7 (2020-25), which include:

Leakage: We have been working hard to return our leakage performance to our desired levels following a series of leakage breakout events caused by notable weather. In spring 2023 we undertook a root cause analysis behind our AMP7 leakage performance, leading to the implementation of our enhanced leakage recovery plan.

As reported in our WRMP annual review 2024[36], we have spent an additional £1.4 million compared to the previous year on our leakage detection and repair, and due to our significant efforts, we have seen a 4 Ml/d decrease since 2022-23 and leakage is continuing to fall. Our additional investment has provided:

- Enhanced leakage detection resource
- Enhanced repair resource
- Enhanced data analytics capability
- New acoustic leak detection equipment
- A full independent review of our monitoring and targeting approach to leakage
- The increased subdivision of our network to enhance leakage detection

As a result of these interventions and scrutiny we are confident we will reduce leakage to an annual average volume that is close to that forecast for the WRMP24 starting position. We are predicting that our leakage levels will reduce back to a spot value of 24 Ml/d by March 2025. This will place us in a strong position to meet the first year of WRMP24 and AMP8 annual average target of 22 Ml/d in 2025-26.

Once we are back on track, our monitoring plan in Appendix 10A identifies that we will use our WRMP24 forecast annual average rates (Ml/d) as an approximate trigger for the development and implementation of future action plans to protect customer supplies.

With respect to our PR19 performance commitments, because of the nature of the three year average calculation for Ofwat delivery targets, achieving these targets presents us with a significant challenge.

PCC reductions: We are forecasting not to meet WRMP19 Per Capita Consumption forecasts by the end of AMP7 which is largely driven by Covid-19 and the longer term shifts in household water use in the region. Covid also impacted our metering and water efficiency work.

As reported in our WRMP annual review 2024, in 2022-23 we experienced our lowest PCC levels since the start of the AMP. The year was not considered to be 'normal' due to the developing drought scenario during the summer 2022, which saw us implement an enhanced communication and water efficiency campaign, as well as the situation receiving wide national press coverage and debate. Although we did not implement Temporary Use Bans, we believe the drought debate and the implementation of Temporary Use Bans by Southern Water additionally supressed our customers use of water, in addition to the effect of our own campaign.

This year was on the other end of the spectrum and not considered 'dry' due to the high rainfall experienced during 2023 (the fifth wettest year since 1990). Our water efficiency

[36] https://www.portsmouthwater.co.uk/wp-content/uploads/2024/07/Portsmouth-Water-WRMP-Annual-Review-2024.pdf

messaging continued and combined with on-going higher energy costs and the cost-of-living crisis have combined to influence PCC. It is challenging to fully understand the root cause of any PCC fluctuations with the weather and other socio-economic factors in flux. We anticipate the data collected following the implementation of Smart Metering will give us much improved insight.

Within our Revised WRMP19, our demand management options relating to household PCC in AMP7 are:

- Household water efficiency programme
- Optants (metering)
- Change of occupancy (metering)
- Universal metering (after 2024-25)

Despite the wetter than average summer, we maintained our water efficiency communication campaigns. We also encouraged customers to sign up to our Get Water Fit website to access free water saving gadgets and to undertake personal water efficiency challenges. This year we passed the milestone of 10,000 customers registered on the Get Water Fit website and engaging with the water efficiency messaging. Through all our messaging we continue to encourage our customers to use water wisely.

In our most recent re-forecast for the WRMP24 we are targeting 36,059 meter installs, including over 20,000 'not for revenue' meters to mitigate the decline in Change of Occupier metering opportunities. There has been a clear decline in house moves compared to 2021-22, driven by both the cost-of-living crisis and less favourable stamp duty policies. In addition to this, we have already converted most customers who are readily willing to convert to a meter (Optants).

Where we have fitted a 'not for revenue' meter to a customer's premise, we will work with that customer to see if they are better off to change to a metered bill and agree to being switched to such an arrangement straight away. Notwithstanding this work, we will also prepare with the customer for the transition to a metered bill in early AMP8, now that our WRMP24 has been approved by the Secretary of State, meaning we are legally able to do so. We estimate this will increase our meter penetration to around 45% (including voids) and closer to the Revised WRMP19 target of 47%, helping to reduce household consumption whilst our smart metering programme begins to build momentum.

Our monitoring plan in Appendix 10A identifies that we will use our WRMP24 forecast annual average rates (Ml/d) as an approximate trigger for the development and implementation of future action plans to protect customer supplies. Further information on our WRMP24 water efficiency strategy is also provided in Appendix 10B, which identifies some of the actions we may take when adapting to challenges (see Section 6).

Non-Household Consumption: As reported in our WRMP annual review 2024, our outturn values were only 0.68 Ml/d (2.1%) higher than the Revised WMRP19 forecasts. In addition to our Household metering and water efficiency activities, this year we have also undertaken water efficiency projects targeting a reduction in commercial use.

Working with the site owners and service partners, a water efficiency audit of the large office complex at Lakeside North Harbour site has resulted in a significant reduction in water usage. Through repairing or replacing taps, toilet cisterns, showerheads in the facility the exercise resulted in a verified saving of 32,061 litres per day. These savings are equivalent to the savings we estimate we would achieve through the installation of 460 household meter installations.

In March 2024 we also completed water efficiency work with the 12 Premier Inns operating in our Region, again looking at taps, toilets and showers. We are still awaiting the verified

savings to be reported, but the estimated savings are of a similar volume to the North Harbour exercise (a further c.450 household meter equivalent).

We recognise that it will be challenging to meet our WRMP24 starting position. However, we have recently commenced a targeted programme of work to (i) identify non-household properties with the highest consumption, (ii) examine the available meter data and (iii) offer to work with retailers and their customers to help them reduce their demand for water. This is in advance of our plans to roll out smart metering to non-households during AMP8.

As we move into AMP8, our monitoring plan in Appendix 10A identifies that we will use our WRMP24 forecast annual average rates (Ml/d) as an approximate trigger for the development and implementation of future action plans to protect customer supplies.

Supply Options: These options include Deployable Output (DO) recovery at Source J, C, H and O, and Source S Drought Permit.

In summary: Source H was delivered in 2022-23, Source O was delivered in 2023-24 and Source C is to be delivered in 2024-25. The DO benefit of these schemes is captured in our baseline DO between 2023-24 and 2024-25 (Line 6.1BL). Source J has been removed as additional analysis found limited yield benefits. Since WRMP19 we have undertaken updated DO modelling and therefore the DO benefits of these schemes will differ from those published in WRMP19 planning tables. For Source S Drought Permit, updated modelling was completed in 2020-21 but additional pump tests are needed during dry periods.

Further information on our performance against WRMP19 targets can be found in our WRMP annual review 2024[37].

[37] https://www.portsmouthwater.co.uk/wp-content/uploads/2024/07/Portsmouth-Water-WRMP-Annual-Review-2024.pdf

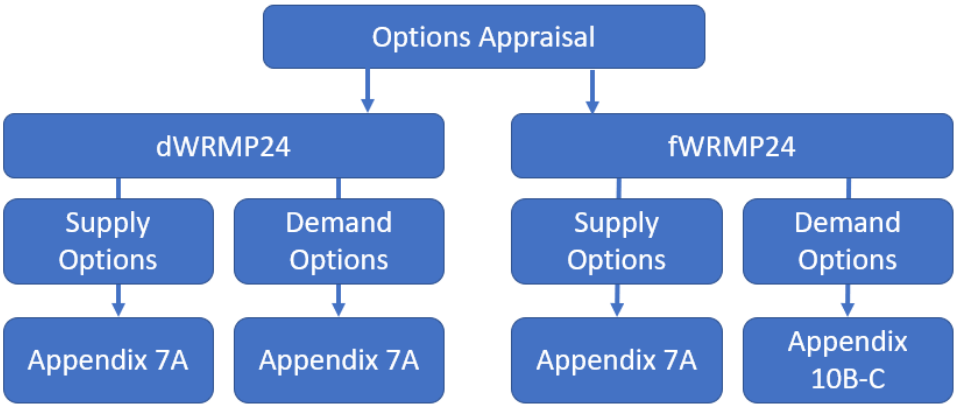
7 OPTIONS APPRAISAL

7.1 Overview

This overview section details the key updates to Options Appraisal since the dWRMP24 and signposts to further information (Figure 75). In order to maintain the processes followed in the dWRMP24, the changes since the draft plan have been added for clarity. The updates included a review of further demand options to meet the updated demand reduction targets as detailed in Section 1.9. This resulted in a revised 'High Plus' demand basket. The other demand baskets considered in the dWRMP24 are no longer considered as they didn't provide enough benefits to meet the targets.

In summary, the assessment of supply options remains largely unchanged but the appraisal of options for demand schemes has been updated. Figure 75 provides signposting to documentation utilised for the draft and final WRMP24.

Figure 75: Signposting for options appraisal changes since the draft and final WRMP24



We have a twin track approach, considering options that reduce demand for water as well as options to increase supply. The sensitive nature of our supply area means that there are no new options to abstract water from the chalk aquifers underneath the ground, or the chalk streams and rivers that flow from this geology[38].

Similarly, our neighbouring companies have the same constraint in the short term and so importing water for them is not an option until major infrastructure can be constructed. This situation has led us to focus upon options to reduce the forecast demand for water, look for ways to use water better by improving the connectivity across our pipe network, and explore new ways of supplying water through desalination and water recycling.

The limited supply options available to us was only one of the factors that led to our focus upon options to reduce customer demand. We also needed options with a short delivery time that could help to reduce the deficit between supply and demand near the start of the plan. In addition, we want to support delivery of the Government's aspiration of reaching a national average per capita consumption of 110 litres per head per day by 2050 (in a dry year) and help to deliver the UK Water Efficiency Strategy published by Waterwise in 2022.

[38] Since the dWRMP24 we have a greater understanding of Environmental Destination and what future supply options may be possible, for example, options to capture to store excess winter flows. Therefore, we expect for WRMP29 we will have a greater number of supply options considered. This will be supported via our WINEP investigations which are detailed in Section 3.2 of Appendix 5B.

Havant Thicket Reservoir has not been included in our option appraisal process for this WRMP24 as it already forms part of our baseline plan and has been pre-selected in the WRSE regional investment model. The reservoir has received planning permission and is currently in construction phase. It is to be filled and topped from Source B Springs in winter, providing a water supply in dry years and droughts.

The options appraisal process for this WRMP24 differs from previous WRMPs in that we have aligned our process much more closely with the other water companies in the region via WRSE.

Before options appraisal works began, WRSE commissioned a gap analysis of all the water companies' WRMP19 plans across the South East of England. This resulted in a methodology based on wider regulatory guidance and best practice from across the companies. This methodology provided a regional framework so that options across the water companies in the South East were developed in a consistent manner and therefore could be compared fairly in the WRSE regional investment model.

Figure 76 summarises the overall options appraisal process for WRSE, from the exploration of generic option types, through to investment modelling. Starting with the widest range of options, it sets out how the list was refined by allowing option types and specific options to be rejected for robust reasons at different stages. It indicates where WRSE-led workstreams and water company activities run in parallel. Appendix 7A presents the approach and outputs of our contributions highlighted in red.

The regional framework follows a similar process to that used in previous WRMPs. Initially a list of options was developed, known as the unconstrained list. This consisted of options identified in previous WRMPs and new options identified for this WRMP24, as described in Section 7.2. These options were put through a two-stage screening process to screen out options that could be demonstrated as environmentally unacceptable or that offered an insignificant water resource value. More details of this process can be found in Section 7.3.

The screened set of options forms our Feasible Options list (see Section 7.7) for which we developed appropriate costing information (Section 7.6). These options were then collated with those developed by other water companies in WRSE, and further options developed separately by WRSE. This list of options was then taken forward for investment modelling by WRSE from which the draft regional plan and our WRMP24 was derived.

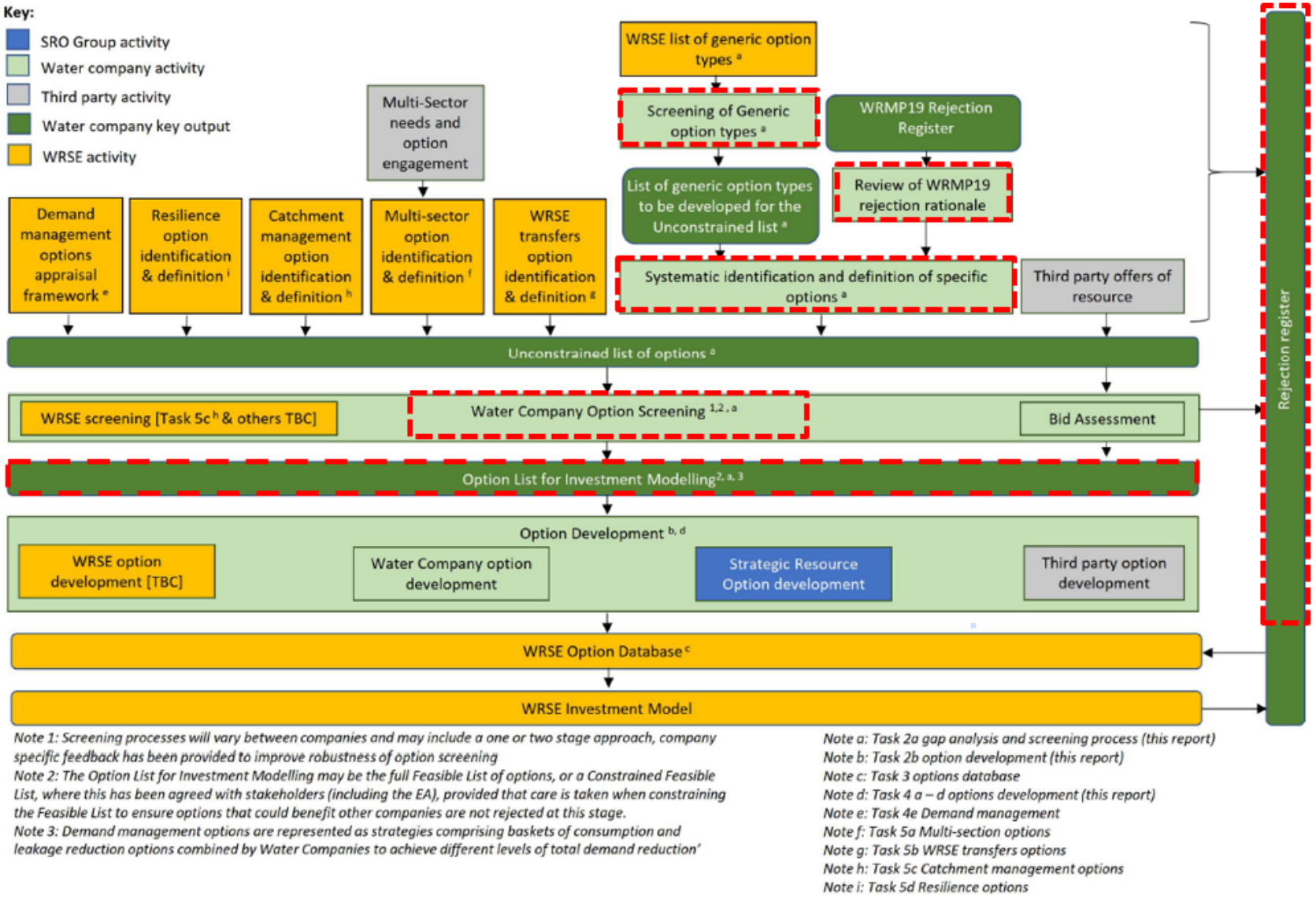


Figure 76: Summary of the options appraisal process for WRSE through the exploration of option types, with the elements completed by us shown in red dashed boxes. An adapted figure 2–3 within Mott MacDonald 2020a

7.2 Unconstrained options set

To produce our unconstrained options list, we collated options from several sources, see Figure 77. This included:

- A review of WRMP19 options.
- A review of WRMP19 rejected options.
- A systematic process of reviewing generic option types to develop new options.
- Third parties submitted options.
- WRSE led development of options.

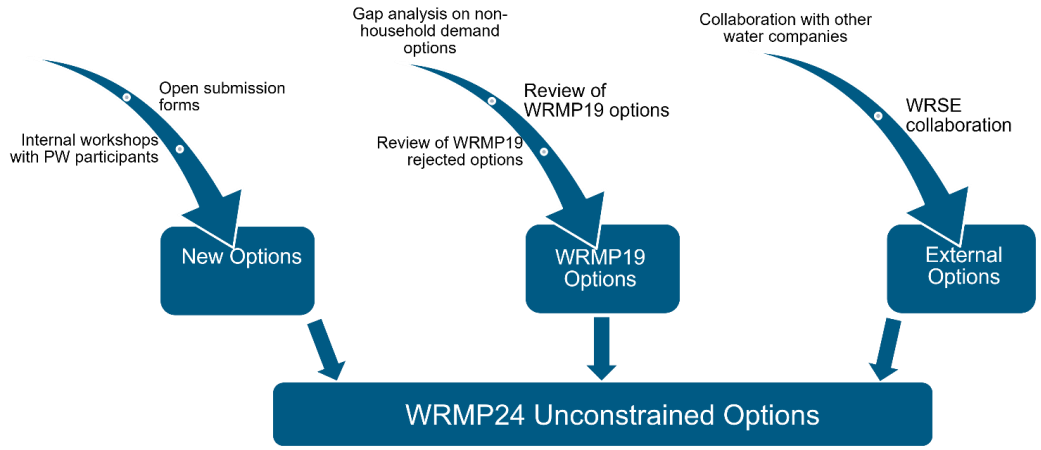


Figure 77: Overview of the dWRMP24 options appraisal process.

7.2.1 The internal process for generating new options

WRSE defined four broad multi-sector categories for investigation of new options, as shown in Figure 78. These categories cover a wide range of generic option types, and we reviewed each option type for their appropriateness. See appendix 7A for details of our generic option screening.

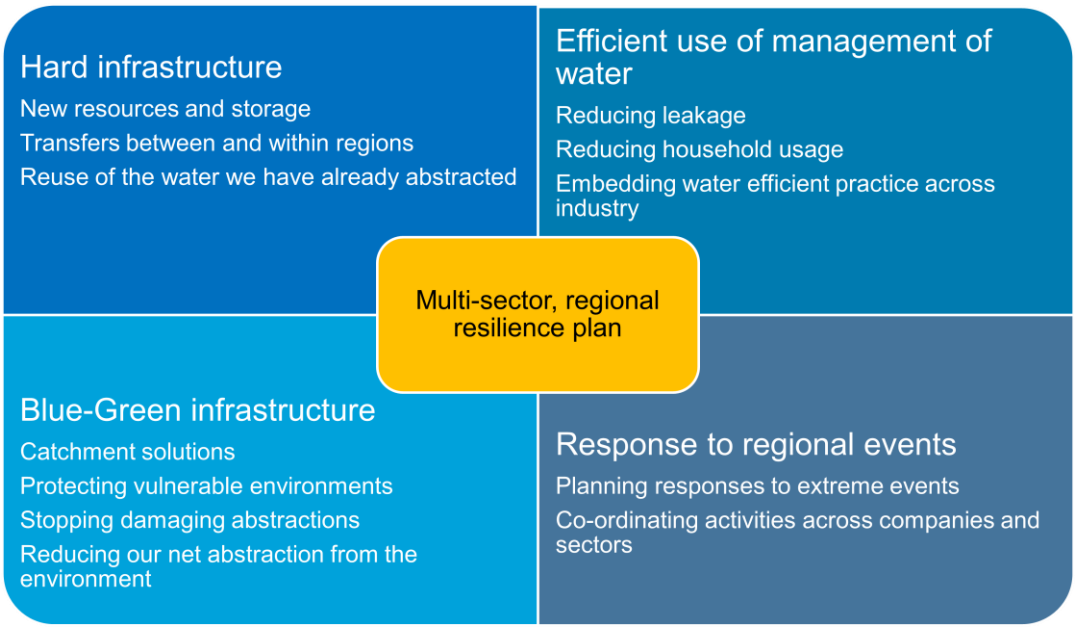


Figure 78: Option groups categorised by WRSE. Adapted from Wood (2022).

To investigate the potential for new options from the types defined in the generic option list, we ran four focus groups for each of the four broad categories, inviting staff from across our company. This allowed the inclusion of those not normally involved in the options process to be included, generating new ideas.

We collated notes on options from the workshops to undergo an initial screening and placed them in each of the four option categories shown in Figure 78. Through the workshops we identified 59 options. We carried out an initial screening to identify if there was any repetition in suggestions, and their feasibility, reducing it to 29 options.

We also encouraged an open submission of options from staff by sending out submission forms. Our staff submitted an additional 18 options which were reduced to 15 following the same initial screening process as for the focus group options.

The gap analysis carried out by WRSE of our WRMP19 plan also demonstrated the necessity for non-household demand options. To address this, we carried out an analysis of non-household user and demand data to understand the user base, and to identify differences in water use and demand drivers (domestic uses and leakage). We generated a further 9 options though this process.

Using insight from the water resource model of our supply system created in the Pywr modelling package we have identified one further option. During analysis of the modelling results, a bottleneck was identified in our supply system which facilitates west to east transfers within our supply area. This led us to develop a further option to increase the booster capacity at our Source O location and unlock conjunctive use benefits associated with Havant Thicket Reservoir. More information can be found on the Source O Booster in Addendum A, Appendix 7A.

7.2.2 External

To generate external options, we worked with WRSE, other water companies and third-party groups. This included working with Southern Water to understand possible additional uses for the Havant Thicket Reservoir (see Section 7.8 for further details).

WRSE's Transfers workstream carried out a thorough review of potential inter zonal and inter-company transfers for subsequent testing within the investment model. Options identified via that process were screened and developed separately by WRSE's team.

WRSE's Resilience Options workstream worked with the WRSE member companies to identify and screen additional options for resilience-building purposes (resilience of individual sources, network connectivity, and solutions to build resilience to non-drought hazards).

Table 42 sets out how the work completed by external WRSE groups by mapping it onto the four different option categories defined as part of the WRSE guidance.

Table 42: Generic option type categories and WRSE workstream contributions

Generic option type categories	Validation for WRMP19 options	WRSE workstream
Catchment management options	WRMP19 contained few options in this category. WRMP19 focused on addressing deficits, in contrast to the WRSE regional plan which seeks wider benefits (e.g. river enhancement, habitat creation – and schemes which build resilience and offset the need for licence reductions).	Conducted separate search for catchment and multisector options via workshops and consultations.
Efficient Use and management of water	Multitude of options in this category. Gaps identified were linked to non-household users using independent and mains supplies. Leakage detection and advice for non-household users could be further explored in addition to rainwater harvesting and outage reduction.	N/A
Hard infrastructure	Variety of options due to 'traditional' nature, but gaps found related to shared resources and transfers.	Review of interzonal and intercompany transfers for testing in investment model. Options identified were screened and developed by WRSE.
Response to regional events	Most already covered by unconstrained list. Resilience to non-household users should be further considered.	Worked with WRSE and Portsmouth Water to identify options for resilience purposes such as network connectivity and non-drought hazards.

7.2.3 WRMP19 option review

We reviewed all options that had been considered for WRMP19 in case circumstances had changed in the intervening years and an option that had been ruled out previously was now feasible. Following WRSE guidelines, all WRMP19 options were mapped to the new WRSE option categories and re-screened consistently with new options.

There were 184 WRMP19 options, and these broke down into the WRSE option groups, shown in Figure 78, as follows:

- 1 within blue green infrastructure/catchment management group.
- 97 within efficient use and management of water.
- 69 within hard infrastructure; and
- 17 within response to regional events.

During WRMP19, 158 of these options had been rejected. For WRMP24 we rescreened the entire option set to ensure any changes since WRMP19 have been considered.

The full list of our options can be found in appendix 7A.

7.2.4 New options to increase supply

The catchments in our supply area are designated as 'over-abstracted' within the Environment Agency's Catchment Abstraction Management Strategy. As set out in our baseline supply forecast, we are forecasting a reduction in the amount of water we take from the environment to protect the precious chalk landscape and habitat we operate in (as detailed in Section 7.1, we expect to consider new supply options in WRMP29).

In light of the 'over-abstracted' concerns, we have not considered any new options that increase our demand on catchments in our area. However, given the scale of the supply-demand deficits we are forecasting within our planning window there is a need for further large-scale additional sources of water to prevent water shortages across our company area and in the wider WRSE region. To cover this gap, we have considered the use of wastewater recycling and desalination schemes.

Water recycling and desalination options were reviewed with Southern Water (the Company that provides wastewater services to our customers). Most options were included by Southern Water in their unconstrained options list. Some elements were included in their Strategic Resource Option (SRO) investigations, and many are linked to enhanced use of the Havant Thicket Reservoir.

7.2.5 New options to reduce demand

WRSE provided a high-level framework for the demand reduction strategy of our wider options process. Demand reduction interventions were included in the WRSE investment modelling as combined demand management options, or groups of measures ('baskets') that provide total demand reduction rather than costs and savings with individual measures. WRZ level demand management strategies include leakage reduction, household demand reduction and non-household demand reduction for all necessary climate scenarios.

Since the dWRMP24 the demand options have been reviewed and combined into a single 'High Plus' demand basket of options. This is because the other demand baskets did not meet the demand reductions required under the EIP. These targets are more challenging than those proposed for the dWRMP24 and as a result there are a limited number of demand options available to meet these expected reductions. Therefore, for the final WRMP24 the EIP targets for demand reductions are the main factor in the selection of the demand reduction options.

This has resulted in new and adapted demand options in comparison to the dWRMP24. The following section has been updated accordingly to reflect these changes and where needed cross references to Appendix 10B (Water Efficiency Strategy) and Appendix 10C (Leakage Strategy) are provided. These appendices detail the updated strategies for these demand options, plus how the preferred suit of options was developed.

7.2.5.1 Metering

Low, medium, high and 'High Plus' plus metering strategies have been developed for dWRMP24. For the rdWRMP24 these options have been combined into a single 'High Plus' metering option.

Metering allows demand reduction to be achieved faster and more effectively, and a universal metering policy (included in our 'High Plus' strategy) benefits from increased certainty in the level of meter penetration and the opportunities (including reduction of customer-side leaks) available with metering strategies.

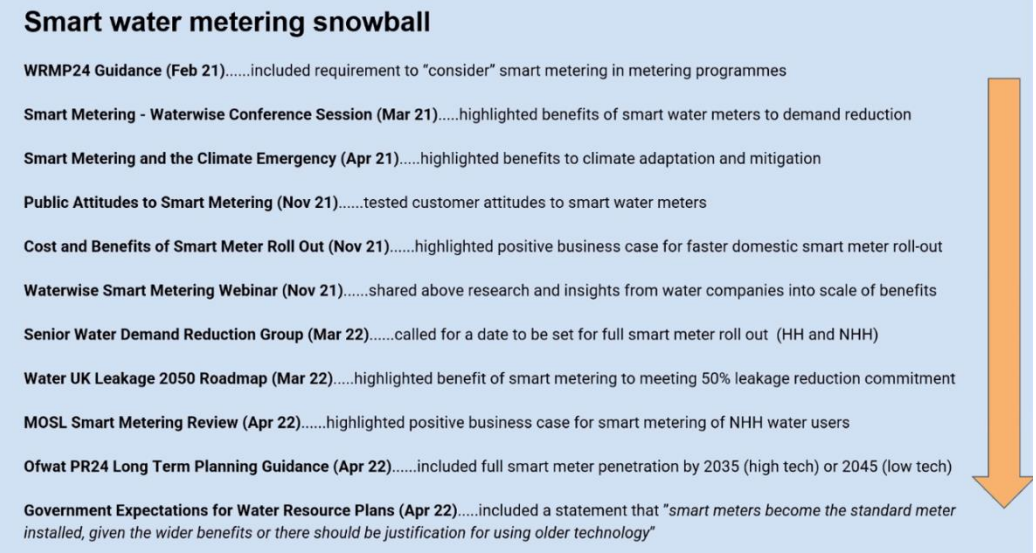


Figure 79: The smart metering 'policy snowball' as described by Waterwise

Metering has been proven to deliver a reduction in household demand. Across the South East, South East Water and Southern Water have completed universal metering programmes, and Thames Water, Affinity Water and SES Water are in the progress of rolling out universal metering. All these companies, in addition to Anglian Water, outside the WRSE planning region, have shared evidence of the water savings delivered through this approach.

Figure 80 shows the headline findings that Thames Water shared in June 2022 at a CIWEM webinar about smart metering. As well as the water saving delivered by reducing household consumption, it also highlights the additional benefits of identifying leaks in household and non-household properties that are running continuously and wasting water. Carrying out a water efficiency visit at the same time as metering has also been shown to have an additional water saving for high household consumers and help with affordability for people who are struggling financially.

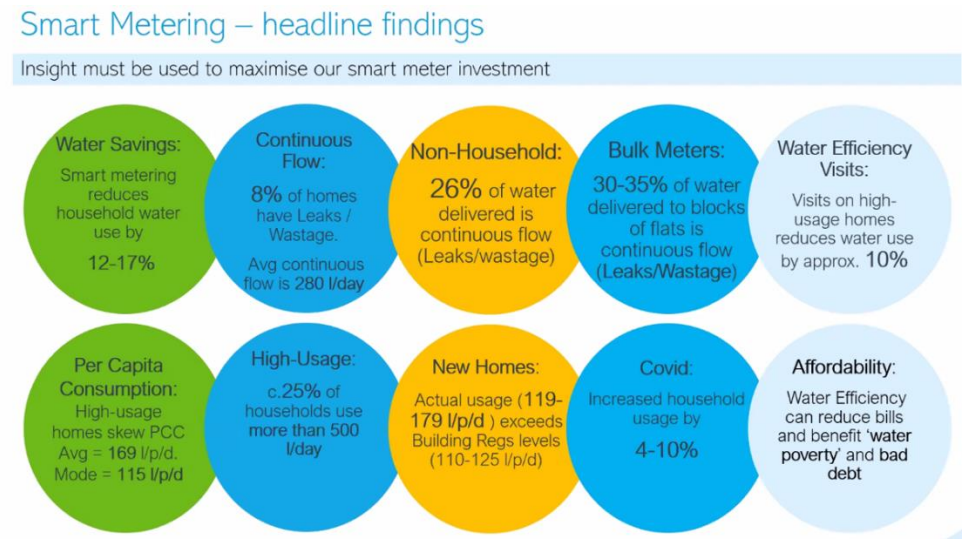


Figure 80: Headline findings shared by Thames Water of their experience installing smart meters (Shared by Thames Water at a CIWEM Smart Metering webinar in June 2022)

We have listened to the shared experiences from other water companies about universal metering to develop a programme that is evidence based and suitable for our customers. As well as the technical details, for instance on the type of meter and billing technology, we have also considered how to engage with vulnerable customers through this programme and how to support customers with affordability concerns.

Based on existing evidence and our knowledge of our supply area we propose to deliver compulsory smart metering over 10 years starting in 2025–26 until 94.7 per cent of the homes in our area are metered in 2034–35.

We will try to meter every household but, based on the experiences of others, expect that some homes will not be possible to meter either because of the pipe configuration of the water supply going into their homes or the logistics involved of installing a meter on the supply pipe.

Our assumption is that household customers will reduce their water use by twelve percent. After consideration, we have chosen to adopt this conservative estimate of savings (compared to other companies' findings) in reflection that our water bills are lower than some of the water companies and therefore the fiscal advantages of using less water are less compelling.

The yield savings assumed by the metering options include both those generated from customer behaviour change and those achieved through reducing underground supply pipe leakage. Since the dWRMP24 we have revised the expected savings from metering, including the indirect benefits smart metering brings. Further information is presented in Appendix 10B.

In addition to delivering water savings through reducing unnecessary use and leakage, metering will enable us to implement tariff options in the future, post the roll out of smart metering.

7.2.5.2 Leakage

Leakage feeds into the demand-side of the options appraisal process. Since the dWRMP24 we have revised our leakage reduction strategy to meet the targets in the EIP. Also based on customer feedback, we have committed to reducing leakage by 50% by 2040, not 2050 as started in the dWRMP24. Appendix 10C details the leakage options considered to meet these reductions and our preferred programme of leakage reductions activities. Please refer to Section 5.2 (unconstrained options), Section 5.3 (feasible options) and Section 5.5 (preferred suits of leakage options) of Appendix 10C.

7.2.5.3 Water efficiency

We have an active water efficiency programme. In our WRMP19 we committed to reduce domestic demand, measured in per capita consumption, by 5 per cent in the current five year period to 2024–25, but domestic demand for water has been higher than planned. This has, in part, been due to the impact Covid-19 has had on consumption patterns over the last 2 years but is also a result of the impact of Covid-19 isolating restrictions on our planned initiatives.

Our water efficiency activities have been enlarged over the last few years as part of a 'PCC recovery strategy'. Following a cost benefit review of the effectiveness of a number of interventions we selected a suite of activity we felt represents our most influential mix of activity, whist also providing value for our customers. Appendix 10B, Section 2 details our current approach to water efficiency and the effects of Covid-19 on demand. This includes:

- Physical solutions (metering, home water efficiency checks, use of smart and leakbot technology and the supply of water efficiency gadgets).
- Behavioural solutions (water efficiency platform, communications, smart metering trials, interactive consumption conservations).
- Replacement solutions (provision of subsidised water efficiency butts).

Our current delivery experiences have helped us understand further possible options. In addition to building on our own experiences of how to effectively engage with customers, we also consulted leading industry experts, and looked to industry best practice and shared experience.

For example, a 2019 study commissioned by Water UK, and delivered by Artesia Consulting[39] assessed the savings, costs and benefits of a wide variety of interventions to reduce demand. This study was intended to help provide evidence to support development of a delivery strategy for the Government's ambition to see reduced household water use as set out in its 25 year Environment Plan.

This report concluded that the most effective way to reduce household water use involves both Government and water companies working together to deliver both mandatory water labelling for water using appliances, and domestic smart metering.

This can be seen in Figure 81 which shows the different options considered and the potential of these options to save water in the long run up to 2065. Government options are shown with red bars, and the potential options of water companies are shown with the pale blue bars. It can clearly be seen that a government mandatory water labelling scheme has significant potential to save water, and at a lower overall cost, measured in pounds per mega litre, than all but one of the other options considered.

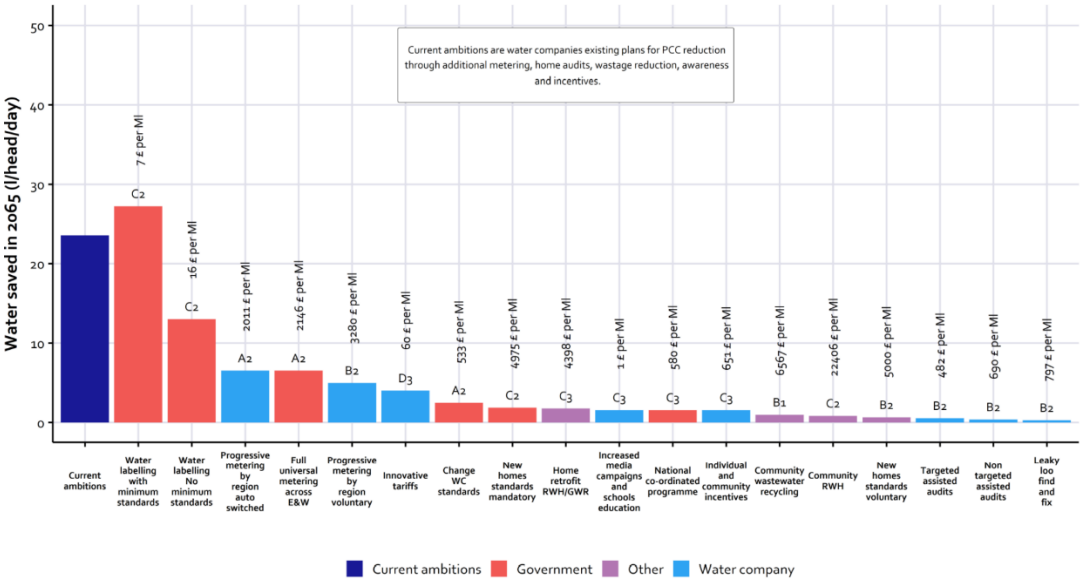


Figure 81: The potential of a wide variety of water efficiency interventions to reduce domestic water demand over the long term, and concluded in the 2019 Artesia study, commissioned by Water UK

The report also led to discussions at regional level with regulators about including a range of government-led demand options that would include the introduction of a mandatory water

[39] Pathways to long-term PCC reduction (water.org.uk), Artesia Consulting, 2019

labelling scheme. Further information on the development of these options, in the form of a WRSE Defra demand saving profile technical note, is provided in Appendix 7C.

For the dWRMP24, the process of developing options to promote water efficiency resulted in 59 unconstrained options for our supply area. For the rdWRMP24, these water efficiency options were reconsidered in light of the EIP targets. A total of 27 options were considered which were then selected down to 13 preferred options to support households and non-households to reduce their demand for water. Please refer to Appendix 10B for further information.

7.2.5.4 Customer priorities on demand options

Customer engagement, described in Section 3.8, helped us to understand which options our customers preferred, and their prioritisation of option types. This section has been updated with customer research since the consultation.

Customers were strongly in favour of the current development of Havant Thicket Reservoir (now part of our baseline supply) due to sustainability, and positive community benefits.

Our customers also showed support for investing in technology and infrastructure to reduce water leakage and the use of grey water recycling. The majority of customers support water recycling due to the reliability aspect, however, customers show concerns over quality and safety. Desalination and water transfers show the least priority due to the perception of being damaging to wildlife and energy intensive. Further research since the dWRMP24 showed support for meeting leakage reductions sooner, which is reflected in us meeting the 50% reduction by 2040, not 2050.

Metering is not seen as the most urgent priority by customers. This is due to hesitancy in data sharing, and anxieties around larger bills for vulnerable customers and larger families. However, smart metering roll outs were supported by seven out of ten customers surveyed, after the benefits of metering (reduction in leakage and saving money and water) were communicated. Further analysis conducted for the dWRMP24 showed overall strong support for metering, with slightly less support for smart metering. The consultation highlighted some customers have concerns about data collected, bill impacts and how we will use the data. Within Appendix 10B we provide further information about our future plan to ensure customers are informed and updated on our roll out of smart metering.

We found those who do not support universal smart metering are more likely to already struggle with affording their bill – reflecting anxiety for some that metering will increase their bill. In response to these concerns, we are working on support strategies to support and focus on water poverty for vulnerable customers. This has been conducted through developing networks within the community and working with business networks and charities. Information is key. Seventy per cent of customers who have listened to an explanation of smart metering, support smart meter usage, whereas only forty-eight per cent of less informed customers support metering, as shown in Figure 82.

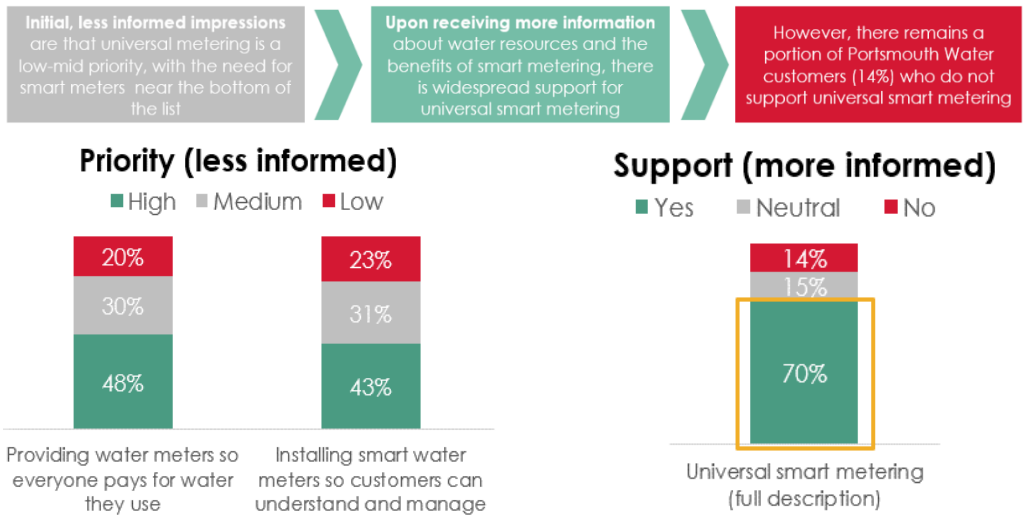


Figure 82: Support for metering increases if customers have received information about smart metering

Attitudes towards water conservation again vary with the knowledge held by customers, with 66 per cent of our customers claiming to be saving water. For example, lack of awareness around the benefits of chalk stream environments, and catchment management measures (which may appear as experimental to some customers) could impact attitudes towards saving water. Additionally, the 65+ age group appear to make more of an effort to save and conserve water, meaning there needs to be a bridging of gaps between customer demographics. Further analysis during the consultation demonstrated strong support for our plans to support customers to reduce demand.

Environmental reasons for saving water seem to be more generalised, with "reducing waste" and saving money being the main reasons for customers prioritising saving water. It appears that barriers such as lifestyle, family size and attitudes hinder people's motivations to conserve and reduce water usage.

Customers' suggestions of how we could aid water saving include rewarding those who reduce their use, more prominent messaging, and demonstrating our efforts to fix water leaks.

7.3 Option screening

WRSE developed an options appraisal process that integrated with our requirements for environmental, resilience and water quality assessments as shown in Figure 83. The options appraisal approach undertaken by WRSE and ourselves promotes integration between the regional and water company WRMP24 options appraisals, allowing both to actively inform the other.

As detailed in Section 7.1 the demand options were refreshed between the dWRMP24 and the rdWRMP24. The selection of the options which formed the high plus demand basket are detailed in Appendix 10B (Water Efficiency) and 10C (Leakage).

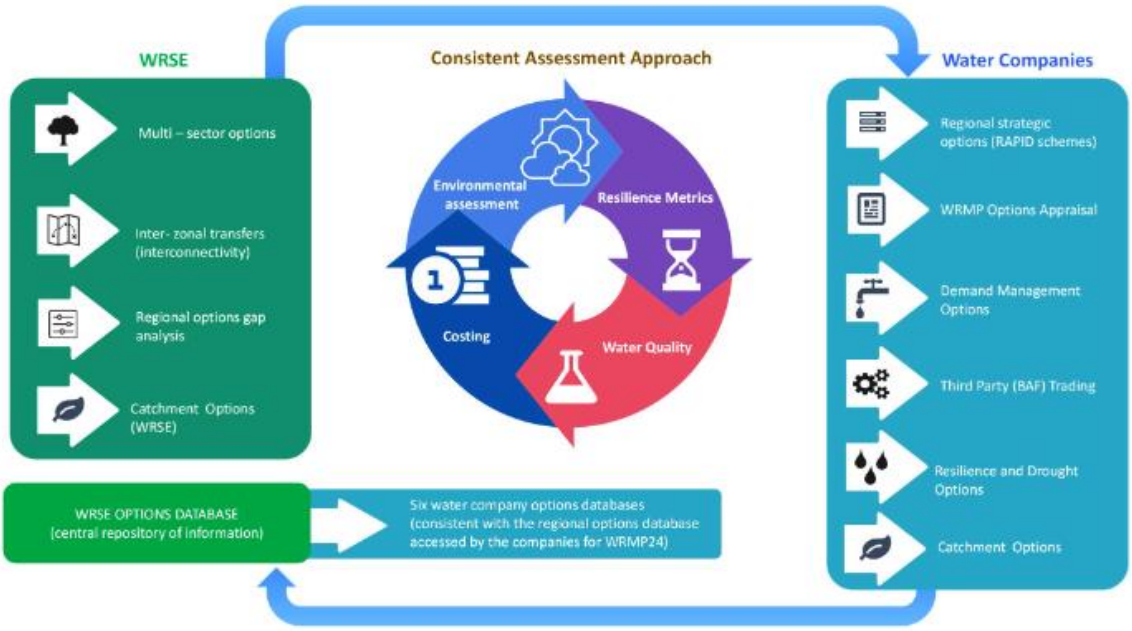


Figure 83: Integrated options appraisal methodology

Initial environmental assessments were undertaken by WRSE. With respect to our dWRMP24, a total of 259 options were considered in the 'unconstrained list', with 184 WRMP19 options, and 75 new options identified.

A list of the unconstrained options can be found in appendix 7A.

Primary screening reviewed the options conducted with 5 test questions, considered on a pass/fail basis, with failure of a test either eliminating the option or screening the option out. The criteria were agreed and applied across the WRSE regional planning area, and were as follows:

- Is the option technically feasible?
- Does the option address the planning problem?
- Does the option avoid breaching any legal/planning constraints?
- Is the option promotable with regulators and customers?
- Is the option likely to be prohibitively expensive for the volume of water produced?

Passed options were then carried through to a secondary screening, with rejected options and AMP7 options added to the rejection register.

Secondary screening takes a more measured approach in comparison to primary screening, where the final decision is based on several factors. Initial environmental screening was undertaken including:

- Habitats Regulations Assessments (HRA).
- Strategic Environmental Assessments (SEA).
- Water Framework Directive (WFD) measures for environmental impacts.

Further criteria were assessed using a RAG approach (red, amber, green). The criteria assessed included:

- Option costs

- Promotability.
- Deliverability and constructability.
- Adaptability to future scenarios.
- Reliance on vulnerable sources.
- Uncertainty around key assumptions.

Options failing at the secondary screening phase were added onto the rejection register. The environmental screening questions can be found in Appendix 7A. The overall summarised process can be seen in Figure 84 and option numbers are summarised in Table 43.

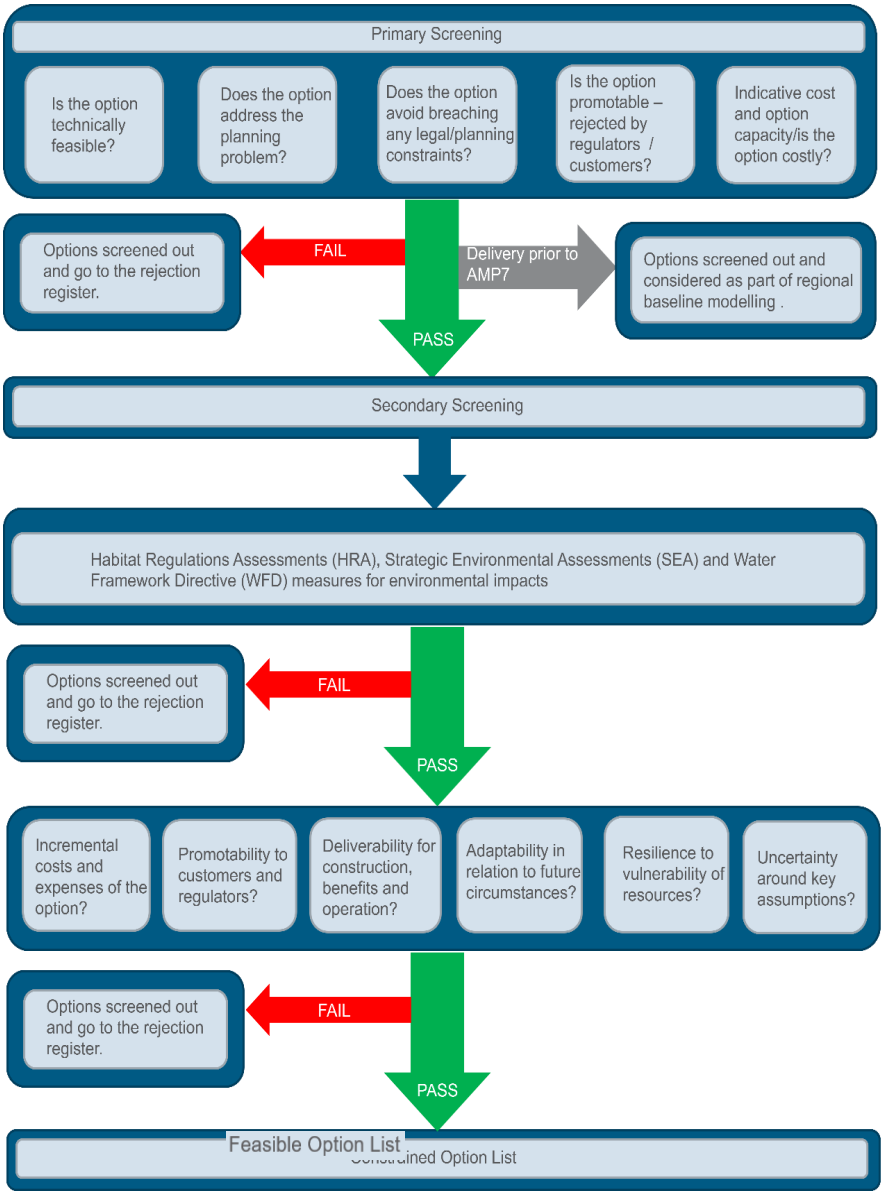


Figure 84: Summary diagram of screening process.

Table 43: Options screening summary table.

Screening	Option screened out	Options carried forward	Additional information
Primary	137	121	Promotability of the option removed 59 Feasibility of the option removed 43 Retrofitting toilets and their issues described from other companies removed 4 Options flagged for future review removed 2
AMP7	6	115	Considered as part of the baseline within regional modelling.
Secondary	41	74	These 74 feasible options included 59 demand management options which were subsequently translated into 4 baskets of demand management. In addition, the Havant Thicket Reservoir was removed as an option after it received planning permission. This left a total of 18 feasible options that were taken forward and included in the WRSE regional option set.

The unconstrained list of options started at 258, which was reduced at each stage, 137 options were removed at primary screening, 6 were required for implementation in AMP7 (prior to WRMP24) and 41 were removed at the secondary screening stage. Additional information on option rejections can be found in appendix 7A.

Deployable output has not been provided for unconstrained options, as it would not have been logistically feasible to estimate and calculate DO for each of the options rejected. DO has been provided for constrained and feasible options. In light of updating modelling and agreement of how options will be utilised, some supply options have an updated DO.

For the rdWRMP24 the demand options were refreshed to meet the updated EIP targets. A total of 27 demand and 14 leakage options were considered to meet the EIP targets (as detailed in Appendix 10B and 10C respectively). These were screened to 12 and 7 water efficiency and leakage options, respectively.

7.4 Environmental assessment

During the option appraisal process, environmental considerations were at the forefront of option development due to the pressure of demand and supply of water, and the environmental affects that are produced through the delivery of new options.

7.4.1 Carbon and Climate Change

We have committed to becoming net zero carbon by 2050, as the UK has domestic targets under the Climate Change Act to reduce greenhouse gas (GHG) emissions. This is inclusive of carbon dioxide (CO_2) in addition to methane, nitrous oxide, hydrofluorocarbons, perfluorocarbons and sulphur hexafluoride.

One of the elements to achieving this ambition will be the investment in energy efficient measures to streamline consumption. This will include minimising water leakage and promoting more efficient water usage as well as sub-metering across production sites to assist with better monitoring energy consumption.

New options will be powered through renewable energy sources and carbon impact will be minimised in the construction and land-use of options.

Since the draft plan we have produced a new supporting appendix (7E) which details our assessment of carbon for the options identified for WRMP24 and the carbon impact of the Preferred Plan.

7.4.2 Environmental Assessments

During the development of our WRMP24, our feasible options were subject to environmental assessments following the methodology in line with WRSE regional plan. This involved SEA, HRA, BNG, NCA in addition to Invasive and INNS and WFD.

Options remaining following the primary and secondary screening exercise and subsequently proposed as solutions by the regional investment model, were further assessed. These options were considered through the assessments described above and via the process outlined in Figure 85.

Since the draft plan, any new options selected in the WRMP24 BVP or one of the alternative plans following regional re-modelling, have also been subject to environmental assessment as described above. The results of the Stage 2 assessments were reported back to WRSE as part of the iterative process and fed into the modelling and the option selection process. In addition, the WRMP24 option SEAs have been informed further by a SSSI Assessment and Heritage Assessment completed as a result of consultation feedback received from Natural England and Historic England.

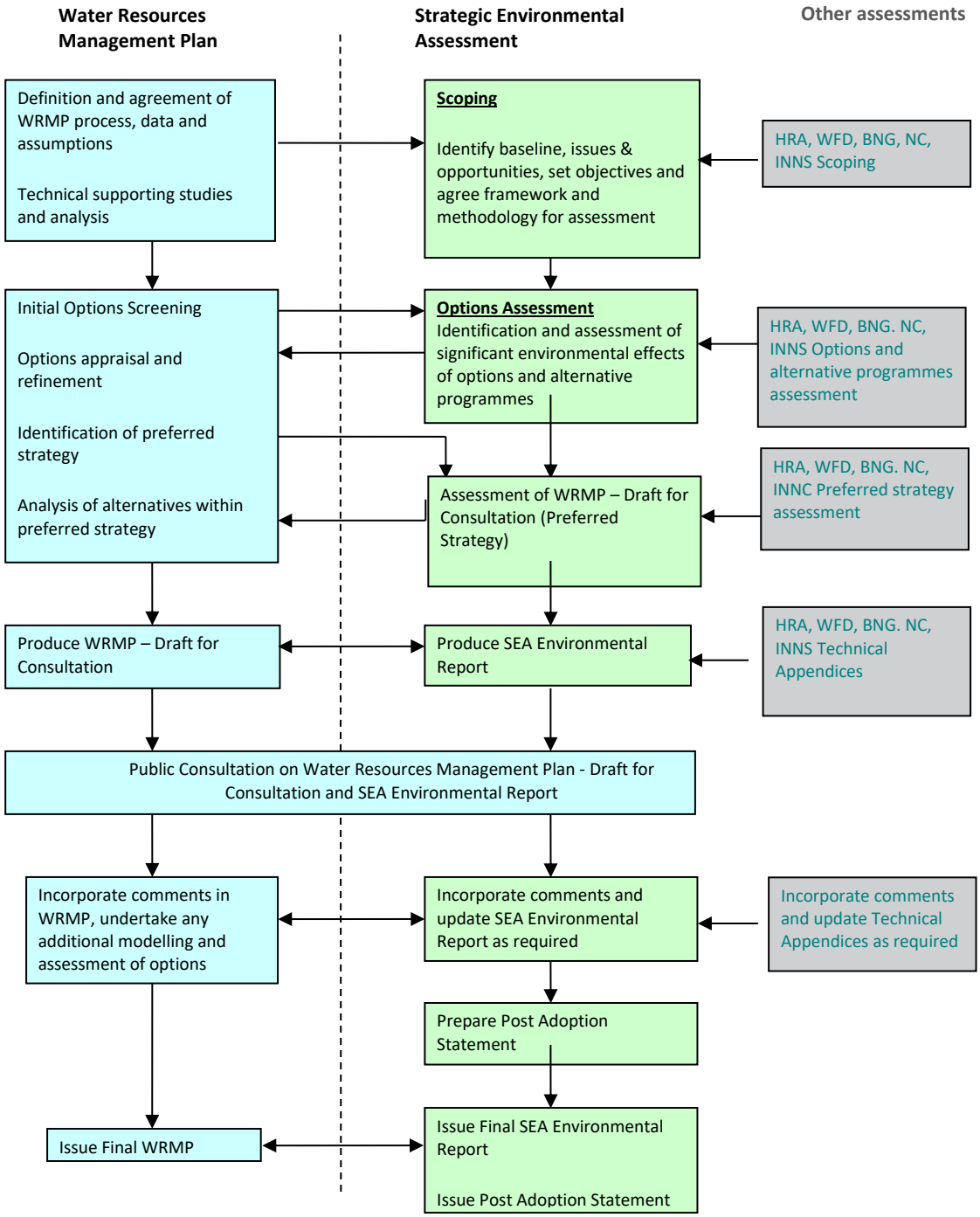


Figure 85 WRMP and environmental assessment (reproduced from our SEA scoping report).

Application of the environmental assessment framework utilised a bespoke Geographical Information System (GIS), which allowed identification of environmental and social constraints through a series of maps and associated information layers to help provide quantitative consideration of where options are located spatially within our supply area.

Each option was considered within its own right in terms of environmental effects, and anticipated effects (beneficial or adverse) were identified for both the construction and operational phases of the potential option. Consideration of the identified anticipated effects also allowed a scale of effect to be applied to each option considering each of the SEA Objectives – those effects deemed to be moderate or major were considered to be significant.

Each option was subsequently considered alongside other options with which it could interact to generate cumulative effects. Further information can be found within our SEA and HRA reports, included within Appendix 1D and 1G.

Where appropriate, WRSE has been informed of the results of the assessments to allow further consideration of more 'local' issues within the draft regional plan. The results also helped to provide relevant information to be considered alongside other technical issues to help identify our preferred best value plan.

7.5 Drinking Water Safety Plan screening

The drinking water directive and inspectorate ensures that water supplied to customers meets regulatory standards, and these quality standards and risks should be accounted for when operating, supplying, and through catchment transfers.

The Drinking Water Safety Plan (DWSP) should ensure that a source to tap risk assessment is completed to limit impact to public health, via mixing, developing options and through upstream sources.

Working with both the Water UK Water Quality Group, and through WRSE, we have developed a screening process for DWSP risks identified as part of the source to tap assessment. This is documented in Appendix 1B.

This work has also been shared with our neighbouring company, Southern Water, where appropriate, to ensure a consistent approach is taken for schemes that are common to both companies.

7.6 Costing

We have developed a consistent approach to costing our options to ensure they can be compared on a like for like basis. This approach has been aligned with the cost consistency guidance provided to water companies from WRSE to ensure that our options have been assessed to a similar level of detail as other WRSE water companies. The WRSE guidance was in turn based on national guidance from the All Companies Working Group (ACWG) to support development of the regionally and nationally important SRO schemes.

By following the guidance, we have produced cost profiles for all our options that are in a consistent format with other WRSE companies. This has allowed us to participate in the regional investment modelling run by WRSE. This modelling allows us to develop robust plans to meet demand in a range of potential futures. See Section 2 for more details on our adaptive planning process.

Each option has been assessed for several variables that make up the overall cost of an option. This includes:

- Capital Costs (CAPEX) - To comply with WRSE guidance, all CAPEX costs have been split into asset life categories as defined in the WRSE Cost Consistency Methodology (Mott MacDonald, 2020).
- Operating Costs (OPEX) – this has been split into fixed (cost per annum) and variable (cost per unit of water).
- Carbon – this has been split into fixed (tonnes per annum) and variable (tonnes per unit of water).
- Electricity – Electricity (kWhr per unit of water) costs have been separated out from other operating and carbon costs to allow the assessment of the impact of national energy policies on the price and carbon.

- Optimism bias – each option has been assessed for its level of development using the methodology set out in the supplementary guidance of the HM Treasury Green Book (HM Treasury 2020). Using this guidance, a value for optimism bias has been assigned to each option, expressed as a percentage of the CAPEX costs.

The cost benefit of each option was calculated, producing an Average Incremental Cost (AIC) based on pence per cubic meter over the lifetime of the planning period. This is shown in Table 4 of the WRMP24 Planning Tables.

7.6.1 Costing supply options

Our supply-side options have been costed using a range of sources, this includes our own cost database based on previous projects we have completed in the past. Where we have had little previous experience with an option type, we have consulted with industry experts to develop cost estimates based on current best knowledge.

Following industry best practice, we then had our costs assured by independent consultants prior to submitting our costs to WRSE, and then again audited by Jacobs who assured the ways that options were costed at a regional level.

7.6.2 Costing demand options

WRSE asked each company to use their own tools and calculations to cost demand side options including for leakage and usage reductions. For leakage we have a well-established method of optimising the most cost-effective way to deliver specified leakage target. This was audited in 2021 before the demand options were submitted to the WRSE for modelling.

For water efficiency and metering, we identified costs, savings and delivery approaches based on evidence from trials we have run ourselves, but also published best practice across the industry. Profiles were developed of demand reduction, along with CAPEX, OPEX and carbon. For universal metering we considered the experience that has been shared by the other water companies across the South East several of whom started delivering universal metering over ten years ago and engaged industry experts to review and comment on the cost.

7.7 Feasible Options

Our feasible options for our WRMP24 list contain 19 options to increase supply, reduce demand and optimise our network (see Table 44). Further detail on the feasible options can be found in Appendix 7A (for supply schemes) and Appendix 10B and 10C (for demand options). They include:

- Basket demand reduction measures (based on the WRMP24 options considered in Appendix 10B and C)
- Four drought and level of service measures.
- One option to improve network connectivity.
- One import from Southern Water
- 12 supply options consisting of different capacities of two variants to transfer and treat water from Havant Thicket Reservoir and take it to other parts of our supply area.

This feasible option set was independently assured and then submitted to WRSE where they formed part of the regional option set, along with the feasible options set from other water companies and third parties across the region.

Table 44: Feasible options for the WRMP24

Option Type and Name	Option ID as per the WRMP24 Planning Tables	Further information	Group Earliest Possible Operational Start
High Plus Demand Basket	Portsmouth Water Demand Basket	Option consists of a range of leakage and demand reduction options*	2025-26
Non Essential Use Bans	PRT_PRT_RE-OTH_ALL_ALL_neubs	Non Essential use Bans for non—households	2025-26
Temporary use bans	PRT_PRT_RE-OTH_ALL_ALL_tubs	Temporary use bands for households.	2025-26
Drought Permit: Source S	PRT_PRT_RE-DRP_ALL_ALL_Source S drought	Drought permit finishing in 2040–41. A range of sub options considered with varying end dates.	2025-26
Resilience change from 1-in -500 to 1-in-200	PRT_PRT_200_los resilience	Change from levels of resilience from 1-in-500 to a 1-in-200 level of service **	2025-26
Upgrade Source O Booster to 25Mld	PRT_PRT_HI-ROC_ALL_ALL_Source O booster	Upgrade Source O Booster to 25Mld	2031-32
Import from Southern Water	PRT_SRN Otterbourne WSW-Source A p	Import from Southern Water's Hampshire Southampton East zone (SWSHSE) zone	2030
Additional treatment at Works A (range of variants and sub options in terms of pipelines and water treatment work upgrades). Abstracted Water is via Havant Thicket Reservoir	PRT_PRT_HI-ROC_NET_ALL_Works A to Service Reservoir B 10	Havant Thicket to Service Reservoir B via Works A 10 Ml/d	2034-35
	PRT_PRT_HI-ROC_NET_ALL_Works A to Service Reservoir B 20_p1	Havant Thicket 20 Ml/d to Service Reservoir B via Works A: Phase 1 10 Ml/d WTW	2034-35
	PRT_PRT_HI-ROC_NET_ALL_Works A to Service Reservoir B 30_p2	Havant Thicket 20 Ml/d to Service Reservoir B via Works A: Phase 2 10 Ml/d WTW	2034-35

Option Type and Name	Option ID as per the WRMP24 Planning Tables	Further information	Group Earliest Possible Operational Start
	PRT_PRT_HI-ROC_NET_ALL_Works A to Service Reservoir B 30_p1	Havant Thicket 30 Ml/d to Service Reservoir B via Works A: Phase 1 10 Ml/d WTW	2034-35
	PRT_PRT_HI-ROC_NET_ALL_Works A to Service Reservoir B 30_p2	Havant Thicket 30 Ml/d to Service Reservoir B via Works A: Phase 2 10 MLX/d WTW	2034-35
	PRT_PRT_HI-ROC_NET_ALL_Works A to Service Reservoir B 30_p3	Havant Thicket 30 Ml/d to Service Reservoir B via Works A: Phase 3 10 Ml/d WTW	2034-35
New Water treatment Works at Service Reservoir C and Pipelines (to treat and move water from Havant Thicket Reservoir)	PRT_PRT_HI-ROC_NET_ALL_Works A to Service Reservoir B 10	Havant Thicket to SWS Otterbourne WSW spur to Service Reservoir C: 10 Ml/d	2034-35
	PRT_PRT_HI-ROC_NET_ALL_Works A to Service Reservoir B 20_p1	Havant Thicket to SWS Source A 20 Ml/d spur to Service Reservoir C: 10 Ml/d WTW Phase 1***	2034-35
	PRT_PRT_HI-ROC_NET_ALL_Works A to Service Reservoir B 30_p1	Havant Thicket to SWS Source A 30 Ml/d spur to Service Reservoir C: 10 Ml/d WTW Phase 1***	2034-35
	PRT_PRT_HI-ROC_NET_ALL_Works A to Service Reservoir B 20_p2	Havant Thicket to SWS Source A 20 Ml/d spur to Service Reservoir C: 10 Ml/d WTW Phase 1***	2034-35
	PRT_PRT_HI-ROC_NET_ALL_Works A to Service Reservoir B 30_p2	Havant Thicket to SWS Source A 30 Ml/d spur to Service Reservoir C: 10 Ml/d WTW Phase 1***	2034-35
	PRT_PRT_HI-ROC_NET_ALL_Works A to Service Reservoir B 30_p3	Havant Thicket to SWS Source A 30 Ml/d spur to Service Reservoir C: 10 Ml/d WTW Phase 3***	2034-35

Option Type and Name	Option ID as per the WRMP24 Planning Tables	Further information	Group Earliest Possible Operational Start
*High plus demand baskets includes the following sub options ID: PRT_PRT_EF-LKR_ALL_ALL_dmp prt gov c+2, PRT_PRT_EF-WEF_ALL_ALL_vulnerability high+, PRT_PRT_EF-WEF_ALL_ALL_meter csl high+, PRT_PRT_EF-WEF_ALL_ALL_leak_alarm high+, PRT_PRT_EF-WEF_ALL_ALL_innovative tariffs high+, PRT_PRT_EF-WEF_ALL_ALL_gadgets high+, PRT_PRT_EF-WEF_ALL_ALL_education high+, PRT_PRT_EF-WEF_ALL_ALL_comms high+, PRT_PRT_EF-WEF_ALL_ALL_awareness high+, PRT_PRT_EF-WEF_ALL_ALL_audit_nhh high+, PRT_PRT_EF-WEF_ALL_ALL_audit_hh high+, PRT_PRT_EF-LKR_ALL_ALL_leakage_custen high+, PRT_PRT_EF-LKR_ALL_ALL_leakage_alc high+, PRT_PRT_EF-CRE_ALL_ALL_hh_pressure high+, PRT_PRT_EF-CRE_ALL_ALL_comp metering high+, PRT_PRT_EF-CRE_ALL_ALL_ami_smrt_m_nhh high+, PRT_PRT_EF-CRE_ALL_ALL_ami_smrt_m_hh high+, PRT_PRT_EF-CRE_ALL_ALL_ami_infra high+, PRT_PRT_EF-WEF_ALL_ALL_reduce_consump high+, PRT_PRT_EF-CRE_ALL_ALL_optant_meter high+ ** As detailed in section 7.1 we have the inclusion of a 1-in-500 to a 1-in-200 levels of service option (i.e. the point in which there are rota cuts). In the dWRMP24 this was considered in the baseline but following regulatory feedback it is considered as an option for this final WRMP24. ***These are options relating to the timing and scale of exports to Southern Water The list of feasible options excludes an option (SRN Pulborough WSW To Havant Thicket: 20, 50 and 100 Ml/d) which features in our feasible option list. This option is linked to Southern Water's option to abstract water from Havant Thicket Reservoir to their Sussex North water resource zone. This option is the bi-directional element to transfer water from Southern Water's Pulborough WSW to Havant Thicket Reservoir. This option is not utilised or has available water for Portsmouth Water and therefore not considered a feasible option for Portsmouth Water.			

In addition to our own feasible options, the impact of government led demand interventions were modelled. This option assumes that the government introduces measures to save water through water labelling and water regulations. The assumed start date is modelled as 2025–26 with a maximum saving over the life of the WRMP24 of 21.93 Ml/d. A consistency assessment and profile of demand savings was applied over the WRSE region.

Furthermore, amongst other regionally generated options, WRSE modelled variations to our bulk supplies including a potential reversal of flow direction in our western bulk supplies to Southern Water ('Southern Water Otterbourne WSW to our Source A') i.e. we start to import water instead of export water. Southern Water's rdWRMP24 also includes an option to export water from Havant Thicket Reservoir to their Sussex North region.

7.7.1 Feasible demand options

For the dWRMP24, the complete set of constrained demand side options consist of 74 options, of which 59 are efficient use and management of water. Following the screening process these options were refined to 34 demand reduction options and 11 leakage reduction options to be assessed by the WRSE investment model.

For the rdWRMP24 a total of 27 demand and 14 leakage options were considered (as detailed in Appendix 10B and 10C respectively). These were screened to 12 and 7 water efficiency and leakage options.

The demand options for household water efficiency do not meet all the interim household targets but do meet the 2050 targets. We are committed to achieving the EIP targets where feasible, and during AMP8 we will explore more innovative options in case these are needed, such as the replacement of white goods or changes to our levels of service to bring Portsmouth Water into alignment with other companies in the South East. These options will require customer consultation and support and therefore they would need to be considered for WRMP29. Further information is detailed in Appendix 10B.

These options were bundled into a single 'High Plus' demand option which seeks to meet the demand reductions under the EIP targets.

In addition, our feasible options include TUBS and NEUB which are options to reduce customer demand in period of drought. Based on updated modelling for the WRMP24 the DO benefit for these schemes has been updated.

7.7.2 Feasible supply options

An overview of our feasible supply options is presented below.

- Havant Thicket to Service Reservoir B– three variations supported by expanded treatment capacity at works A (10/20/30 Ml/d variants).
- Drought Permit Source S –Resulting in up to a 3.4 Ml/d benefit at the water resource zone level.
- Upgrade Source O Booster – Network reinforcement to increase connectivity and unlock trapped DO associated with Havant Thicket Reservoir from 4.1 Ml/d to 7.3 Ml/d. The deployable output has been revised following a conjunctive use assessment. The benefit of the option is now dry year only, so there is no benefit in a normal year. This is to conserve water in Havant Thicket Reservoir for drought periods.
- Havant Thicket to SWS Otterbourne WSW Spur to our Service Reservoir C (10/20/30/40 Ml/d variants).
- Southern Water Otterbourne WSW to our Source A - reversal of flow direction in our western bulk supplies to Southern Water i.e. we start to import water instead of export water.
- An option which reduces the level of service from a 1-in-500 to a 1-in-200 level of service (i.e. the point in which rota cuts are introduced). In the dWRMP24 this was considered in the baseline but following regulatory feedback it is considered as an option for this final WRMP24. The option increases the deployable output available during the period its implemented.

7.8 Southern Water options that interact with Havant Thicket Reservoir

Our Havant Thicket Reservoir project is being delivered in partnership with Southern Water who will be the major beneficiary of this scheme (which is currently in development). However updated modelling indicates that in the future we will need to abstraction additional water from the reservoir to meet our customers demand for water.

Currently, Southern Water is exploring potential future uses of the Havant Thicket Reservoir. Some of the options under investigation would result in changes to the source and volume of water moving through the reservoir (Southern Water's HWTWRP). Careful investigation will be required to ensure that the final water quality of the reservoir meets the regulations for its intended use. The proposals include:

- Building a new water recycling plant south of Havant and using advanced treatment techniques to turn treated wastewater into purified, recycled water. The water would then be transferred via a new underground pipeline to Havant Thicket Reservoir so there is more water available for use during a drought.
- Building a new underground pipeline to transport raw water from the Reservoir to Southern Water's Hampshire Southampton East (HSE) WRZ, where it would be treated further to become drinking water.

Water recycling is an advanced treatment process which speeds up the natural water cycle to provide a sustainable source of clean, safe drinking water that reduces the amount needed to be taken from the environment.

From the dWRMP24 consultation we understand some customers have concerns regarding the use of recycled water. We hear the concerns of our customers and stakeholders about the water recycling scheme option. We take these concerns very seriously and value the trust of our customers and stakeholders.

We have committed initial support for this Southern Water option; however, we withdraw support to the scheme if it has any doubt over the safety of this water, or the impact it might

have on the environment and leisure facilities at Havant Thicket Reservoir. We will also consider the views of our customers and local stakeholders in the review of our support of the option. We will also commission a third-party independent review of the option as part of its due diligence of the option.

Southern Water is currently carrying out detailed studies and investigations as it explores this scheme further. We are keeping an open mind as it awaits the outcome of these. Water is an expensive commodity to move around and historically water companies have tried to use water available locally as far as possible. But the water resources position in the UK is being challenged by climate change and the growth in population and the water companies have to look further afield to satisfy their customers' needs, at the same time taking care of the natural environment. This is especially true in the water stressed South East, the driest part of the UK receiving only 50% of the average national rainfall levels.

Recycled water could only be provided to Portsmouth Water and Southern Water customers if it meets the very strict legal standards set out by the Drinking Water Inspectorate, an independent regulator whose role is to make sure water companies deliver drinking water to customer's taps that meets very high-quality standards set out in UK legislation under guidance from the World Health Organisation; this includes the key areas of bacteriological and viral quality.

We understand that some customers have concerns about drinking recycled water. As the operator of the reservoir with total control of the water entering and exiting it, we would have to be totally satisfied in the safety of the proposals and subsequent operation before we would allow it to be used as a source of drinking water. We will be speaking directly to our customers about recycled water, giving them the facts, and offering them opportunities to ask questions.

In response to the comments received from customers and stakeholders, as part of this due diligence process, we are currently planning the following:

- A dedicated public group who will review scheme progress. We will invite representatives of the community groups who have voiced strong opinions about the scheme as well as regulators, water quality specialists, environmentalists and public health specialists.

- Regular public meetings which will present research, plans and proposals and invite comments and suggestions.

- We will have scheme proposals and method statements scrutinised and assured by water quality specialists, environmentalists, and public health specialists. The reports produced will be shared with the dedicated public scrutiny group.

- As we are to benefit from the water resources provided by this scheme, we will commission an optioneering study looking at the feasibility of alternative options to inform our WRMP29 and to provide an alternative option if the requirements of this due diligence are not met.

- We will support a research piece and literature review looking at the public acceptability, water quality and environmental impact of water recycling schemes already operational globally. The results will be presented with the dedicated public scrutiny group and at a public meeting.

For the rdWRMP24 we worked with Southern Water on a joint appendix which answers the consultation questions regarding the scheme (please refer to Appendix 7F). This appendix provides further information on the option selection, the treatment process, how drinking

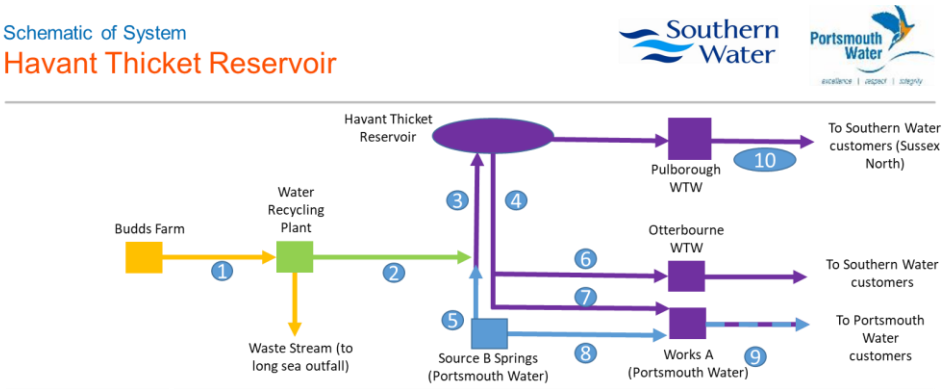
water standards will be maintained and the future assessments and consultations which will be undertaken as the option is developed.

In addition to the joint appendix, Section 10 of our Main Statutory Plan provides further information on the Southern Waters HWTWRP option and how the option interacts with our final supply demand balance and option selection.

7.8.1 HWTWRP option interlinks to our supply network

The HWTWRP scheme would recycle water from Southern Water's Budds Farm wastewater treatment works into the Havant Thicket Reservoir where it would mix with water from Source B. This blended water would then feed a transfer pipeline to a Southern Water treatment works and our own water treatment works. This is demonstrated in Figure 86.

Appendix 7F (Section 1.2) details the key changes between the dWRMP24 and rdWRMP24 and how the option influences Portsmouth Water customers. In addition, Section 10 details how the HWTWTP option interlinks the WRMP24 Preferred Plan.



Type of Water	Element	Description
Treated Wastewater	1	Pipeline transferring treated wastewater between Budds Farm and Water Recycling Plant
Recycled Water	2	Pipeline transferring recycled water from Water Recycling Plant into pipeline
Spring Water	3	Pipeline transferring recycled water and spring water into reservoir
Blended Water	4	Pipeline transferring blended recycled water and spring water to PW & SWS
	5	Source B Springs (Portsmouth Water) site. Pumping stations at site to pump spring water into reservoir and to pump spring water and blended water to Works A (Portsmouth Water)
	6	Pipeline to Otterbourne to transfer blended water to SWS customers
	7	Blended water from reservoir transferred to Works A (Portsmouth Water)
	8	Supply of spring water from Source B Springs (Portsmouth Water) directly to Works A (Portsmouth Water)
	9	In normal conditions, spring water will supply Portsmouth Water customers. In times of drought and emergency conditions, blended water from the reservoir would be used will be used.
	10	Pipeline transferring water from Havant Thicket Reservoir to Pulborough WTW to Sussex North.

Figure 86: Schematic of the flow pathways of the HWTWRP and interlinks to our supply network

8 DEVELOPING THE PLAN

8.1 Introduction

8.1.1 What does the plan have to do?

Our WRMP24 must demonstrate how we intend to achieve a secure supply of water for our customers and a protected and enhanced environment over a minimum planning horizon of 25 years (we look at a 50 year horizon in our plan from 2025 to 2075). The duty to prepare and maintain a WRMP is set out in sections 37A to 37D of the Water Industry Act 1991.

The preferred plan must solve any forecasts of future deficits, whilst allowing for the inherent uncertainties involved in forecasting into the future. For this planning round, there are new requirements of what a company WRMP must do. Water companies must take a leading role in a more holistic and integrated approach to water management, exploring opportunities to deliver cross sector mutual benefits, for society and the environment.

The Government also expects regional groups and water companies to address the challenges set out in the National Framework for water resources using the approaches described in the WRPG. WRMPs should align with regional water resources plans.

Where we identify a risk of a deficit occurring over the planning period, we identify both demand-side and supply-side options that together could be put in place to resolve those deficits. The plan identifies the preferred set of options that are needed to address any deficits. Our plan also takes account of government policies and wider objectives.

Therefore, there are two key sets of inputs needed for investment modelling: the supply and demand forecasts for the planning scenarios being tested; and the feasible set of options (with associated data on the costs of those options and the benefit they provide in terms of helping to satisfy a deficit).

Traditionally, plans were developed to meet deficits at the least cost. Whilst this is still an important criterion, there are other factors which are considered. Our aim is to develop a plan that represents 'best value'. A best value plan is defined as: "*one that considers factors alongside economic cost and seeks to achieve an outcome that increases the overall benefit to customers, the wider environment and overall society*".[40]

Our plan also addresses the inherent uncertainties involved in forecasting both supply of water available and the demand for water over the planning horizon. Therefore an 'adaptive planning' approach has been adopted – one in which we identify low regret options that are needed in the near term, and longer term sets of options that may be triggered at certain points over the planning horizon.

8.1.2 Design drought scenarios

In water resources planning, we are not generally concerned with what would happen in "normal" or wet conditions. We focus instead on dry years – the WRMP effectively provides a long term strategy that interfaces with drought conditions and the management of water resources under those conditions. This is because, from a water resources perspective, dry conditions provide a key stress on the ability of the system to supply enough water to meet customer demand (which often tends to increase during dry, hot weather).

[40] Water resources planning guideline, https://www.gov.uk/government/publications/water-resources-planning-guideline/water-resources-planning-guideline#section-9--aspects-to-consider-in-compiling-a-best-value-plan

Within any given year, the state of supplies and the levels of typical demand will vary. For this reason, we examine through the WRMP24 a number of drought scenarios (or planning scenarios), which must be solved simultaneously to ensure that sufficient water is available throughout the year in dry years. This is in accordance with the WRPG.

These design scenarios are examined in all the different 'futures' that we consider, to test the robustness of our plan to future uncertainties. They ensure that the conditions that could occur in any given drought year are assessed across the planning horizon, for the whole range of future scenarios that are examined.

8.1.3 Planning for a range of plausible 'futures'

Forecasting the future is inherently uncertain. There could be a range of different assumptions that are plausible but that could affect the forecast of supply and demand significantly and in different ways. In Section 2 of this WRMP24, we have described how the various future scenarios have been developed to reflect differing uncertainties.

We have then used these different futures to examine a range of adaptive plans that could address those possible futures. A total of 9 future pathways were identified through WRSE for examination with the investment model to identify the combination of demand management strategies and resource development options or transfers that would satisfy deficits in the future pathways.

8.2 Selection of our decision-making approach

8.2.1 A regional approach

We review and update our WRMPs every 5 years, in accordance with legislation. So much of the current plan is built on our previous WRMPs and work by WRSE. However, this planning round, the regional planning groups have been given a stronger role in co-ordinating and developing techniques across each region to ensure consistency and compatibility of approaches and outputs across all the water companies in the WRSE region – of which we are one of six companies.

WRSE were tasked with developing the decision-making approach and tool (the investment model) that would be used by all companies in WRSE to select their preferred plan.

WRSE developed a series of method statements which were issued for consultation to allow the approaches to be refined to reflect feedback they received, if needed, prior to developing the revised draft regional plans. This included one relating to the decision-making approach: WRSE, *Method Statement: Investment Programme Development and Assessment* (Consultation version July 2020). Please see Appendix 8A for further information.

We review the regional modelling outputs and ensure these are appropriate and compatible with our own objectives and policies. It has been an iterative process, with companies reviewing and challenging the WRSE investment model outputs and providing feedback to the regional modelling team to refine and improve the modelling process and outputs.

The figure below (Figure 87) shows how the plan has been developed from its component parts, and the interface between Portsmouth Water and the WRSE regional planning group.

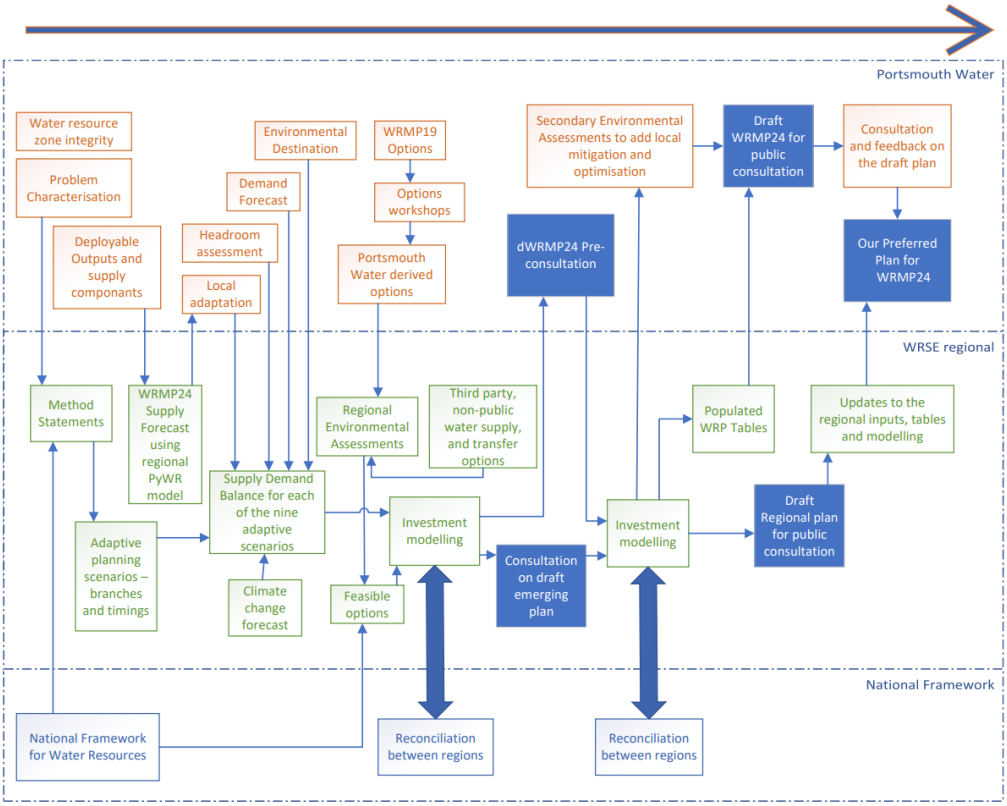


Figure 87: Plan development – interfaces between Portsmouth Water and regional and national water resources planning

8.2.2 Problem characterisation

The process of problem characterisation is used to understand the scale and complexity of the planning problem faced, so that relevant methods can be adopted. This assessment of strategic issues, risks and uncertainties, was undertaken at a regional planning level, to support the selection of the appropriate risk-based methods and the decision-making approach by WRSE.

The problem characterisation was set out in the WRSE *method statement: best value planning*[41] (Jan 2022) and follows UKWIR (2016) guidance (please see Appendix 8B). The overall risk to the South East was deemed to be high. This characterisation supports the use of extended or complex methods. The decision support tools developed through WRSE and used to underpin our WRMP24 reflect the problem characterisation risk level for the South East of England. However, as explained in Section 1.7, the problem characterisation risk level for our own supply area is considered to be similar to the level of risk for the wider region. The decision-making approach adopted is described below.

8.3 Decision-making approach

Traditionally, WRMPs have developed a single future forecast which was stress tested to ensure robustness and revised and updated in subsequent WRMPs as required. However, owing to the potential challenges and significantly wide range of possible futures against

[41] WRSE, *Method statement: Best Value Planning* (Jan 2022), https://www.wrse.org.uk/media/sy1bu4to/method-statement-best-value-planning.pdf (all WRSE documents can be located in the WRSE library: https://www.wrse.org.uk/library)

which we must plan, it was recognised that, as a region, we needed to develop a different approach.

8.3.1 Adaptive planning

It was agreed that WRSE would lead the development of an adaptive plan, on behalf of all the water companies in the South East region, – one which will select all the options needed to meet a wide range of possible future uncertain scenarios i.e. it shows how the investment programme may change through time as key decision points are reached that trigger an alternative pathway. This is an advanced decision-making method, which is necessary because of the scale and complexity of water resources planning required by the water companies in the South East.

Some of the factors affecting the potential pathway will follow forecast trends (such as climate change or population growth), while others may involve relatively significant step changes in the deficit forecast. The initial choices made early in the planning period will affect the later branches, which is why the early stages focus on 'least regrets' options and enabling activities.

This adaptive planning approach is recommended by both the WRPG and the National Framework for Water Resources. The selection of the adaptive planning scenarios or pathways (described in Section 2 of this WRMP) was developed between all the companies through WRSE. These have been examined through the WRSE investment modelling process. The adaptive planning approach includes the following elements:

- A set of pathways that demonstrate how investment is planned for under different possible futures, and so how investment may change as a different pathway is triggered.
- The initial set of actions and activities required in the short term – the no regrets actions and activities that are needed regardless of which future pathway eventually emerges.
- The above includes actions that ensure that longer term options are kept open as we move onto alternative pathways.
- A monitoring plan that sets out how we would track progress and identifies the triggers that would confirm that we need to shift on to an alternate pathway and when that might be (see Section 0 for further information).

The pathways branch at certain points in time. The selection of branching points was agreed through WRSE to address key regional policy objectives by specific points in the planning period. There are several branching points that have been identified, both in the emerging regional plan and through the consultation responses to that emerging plan. This resulted in consideration of risk-based triggers and policy-based triggers:

- Risk-based triggers – driven by future uncertainties due to environmental ambition, climate change impacts and population growth, and the point at which these exceed the headroom uncertainty allowance that are built into the supply demand forecasts (at a regional level).
- Policy-based triggers – to reflect key policy changes. For example the optimum point from which to transition from a 1-in-200 year level of resilience to a 1-in-500 year level of resilience (which is driven by requirements in the WRPG); or the point in which environmental ambition scenarios should be fully implemented.

An example of this branching was provided in Section 2. The changes to different pathways are driven by monitoring of the impacts of the three factors of population growth, environmental ambition (improvement) and climate change (as discussed in Section 2 of this WRMP). At key decision points, we will understand, as future uncertainties become clearer,

which of the pathway we are most closely aligned to. If necessary, this will trigger a change in the pathway and associated investment programme.

For the investment model it is assumed that by 2030 uncertainties relating to growth rates will have been largely resolved, so that a decision of which of the three growth pathways to follow can be made. Similarly, by 2035 uncertainties in relation to different environmental destination and climate change futures will have emerged, and so identification of the 2040 branch can be made.

Two distinct phases in the regional adaptive planning work have been identified as described in Section 2. A 2025–2035 Priority 'least regrets' phase and a 2035–2075 Adaptive phase.

8.3.2 Best value plans

To determine, for any given adaptive pathway, the optimum set of options, we have, through the WRSE regional planning group, assessed the **best value plan**. As a reminder, The WRPG described a best value plan as: "*one that considers factors alongside economic cost and seeks to achieve an outcome that the overall benefit to customers, the wider environment and overall society"*.

The process of how the best value plan has been identified and decided upon is described in detail in the section below and the journey to the best value plan is shown in Figure 88.

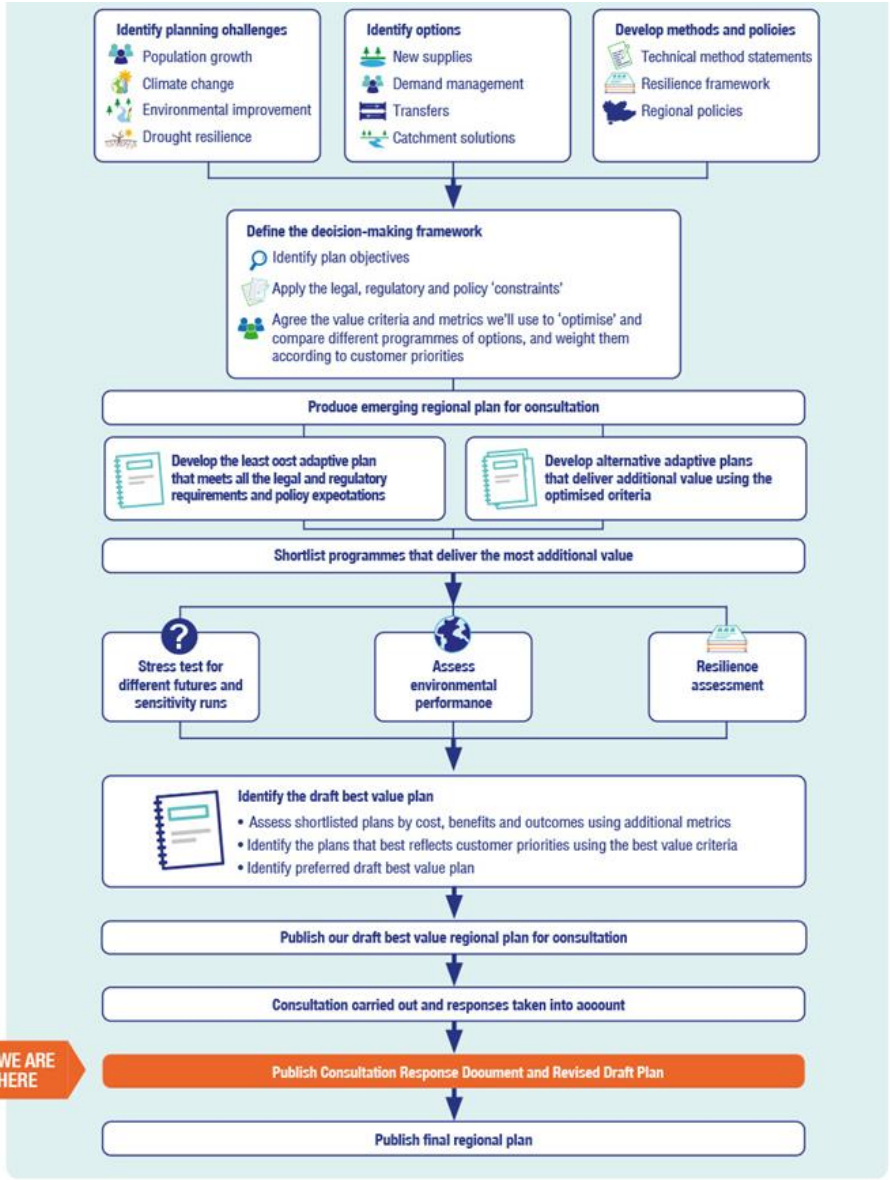


Figure 88 The regional approach to best value planning (from WRSE Revised Draft Regional Plan

8.4 Deciding on best value

In developing our best value plan, we have followed the approach developed with WRSE and set out in their method statement (Appendix 8B).

The investment model has been developed through the WRSE regional planning group. The model identifies the options needed to meet forecast deficits and schedules those programmes of options i.e. when each of the options needs to be implemented over the planning horizon.

The model has been set up to be able to optimise for a range of different objective functions and can examine and optimise for multiple functions at the same time. This means that it will always ensure that there are no deficits in any of the years over the planning horizon, but the way it selects the set of options to achieve this could be based on cost, or environmental benefit, or minimal carbon, and so on.

It can also be used to solve the deficit using several objective functions so that the solution optimises the values of both functions together – for example, it may solve for minimum cost and maximum environmental benefit, or minimum cost ad maximum resilience.

The range of objective functions that were available in the regional investment model are described in the WRSE method statement (Appendix 8B).

The overall investment modelling approach is summarised in Figure 89 and consists of five key steps (A to E).

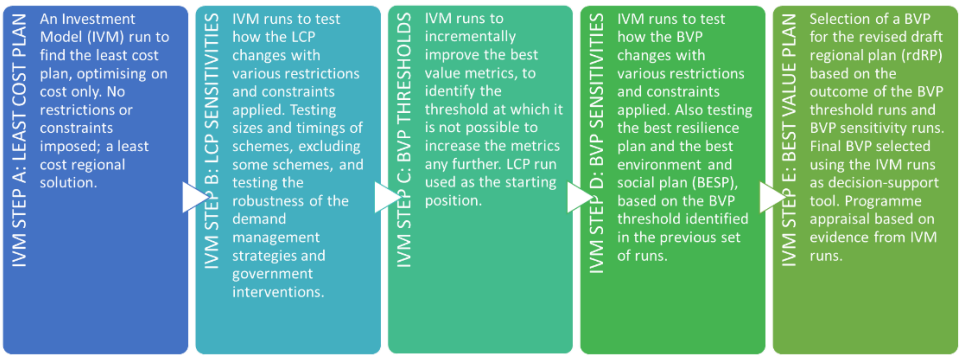


Figure 89: WRSE investment modelling (IVM) and approach towards the best value plan

STEP A: The least cost plan (LCP) is derived using the investment model (IVM). All schemes are available for the model to choose from, i.e., there are no pre-selected or "forced in" schemes, so the IVM is free to select feasible options when available within the planning period.

STEP B: Having derived the least cost plan, a series of sensitivity tests are then undertaken to see what happens to the plan if key schemes are excluded or delayed. These LCP sensitivity runs provide useful additional information to determine how critical certain schemes are to the plan and also whether there are any alternatives to them. Some of these tests also explore different combinations of the size of certain schemes. These tests are also used to see what happens if a policy compliance date moves forward or backwards e.g. how would the investment plan change if the extreme drought resilience compliance date moved back to 2050.

STEP C: Successive model iterations to produce a different set of costs and overall average score of the best value plan metrics for subsequent use in investigating the extent to which best value performance can be improved.

STEP D: The next stage in the process is to consider if the overall best value plan (BVP) metrics could be improved. The investment model is used to derive these plans by imposing thresholds for each of the metrics that it must meet to derive a plan. Each new plan still has to meet the policy conditions and must not have any future supply demand deficits. If they do contain deficits, they are reviewed but they cannot be considered as a viable plan. The thresholds that are set are based on improving the thresholds obtained from the least cost plan run. When the threshold limits cannot be met the model run is infeasible. Successful BVP runs typically cost slightly more than the LCP but have improved BVP scores.

STEP E: Those BVP runs which are feasible are reviewed to understand what additional schemes have been added to the LCP to improve the overall score of the program. Typically, catchment management schemes get included in the plan and although they do not always provide any deployable output benefits, they do provide some limited improvements in Natural Capital, SEA benefits and bio-diversity net gain.

In some BVP model runs schemes are added to the last year of the programme but are never used as part of the regional plan solution. For example, the model run may build a treatment works but not actually use it. Where this occurs these runs are reviewed but are not considered to be viable plans as they include schemes which are not utilised but incur an expense.

The BVP sensitivity testing phase of deriving the regional plan therefore looks at a range of solutions that improve the BVP scores and test these against other BVP runs which explore different availability of options.

8.5 Factors considered in deriving the best value plan

Aside from cost, the regional plan considers the following objectives to derive a best value plan. These are to:

- Secure a wholesome supply of water to customers and other sectors (multi-sector plan) over the planning period. This is an absolute constraint – the plan must achieve this to receive approval.
- Deliver environmental and social benefit.
- Increase the resilience of the region's water systems.
- Deliver at an acceptable cost (i.e. not necessarily least cost, but one that provides other values to the environment and society yet is still acceptable to customers).

There is a set of value criteria for each objective, and where quantifiable, a value metric that allows the additional benefit of that value criteria to be accounted for.

Some of the value criteria are set as hard constraints and they must be satisfied. For instance, securing a wholesome supply of water and demonstrating how the selected plan will achieve this are essential. Other value criteria are used to show how additional value could be added, and the impact that this would have on cost. The value criteria and metrics are used to shortlist best value programmes of options and to aid in the comparison of alternative programmes of options – which solve the key constraint (ensuring no supply deficit over the planning period) but at different financial costs and with different additional value.

We examine the trade-offs between the anticipated additional value that different portfolios of options could provide against the least cost criterion to try to derive something that is best value for the environment, society and our customers.

To examine these objectives to derive best value, the regional investment model is run in 'Pareto mode'. That means it solves all the future branches for each design drought criteria, but with several objective functions – i.e. in addition to cost it may look at resilience, or environmental benefit.

There are almost always several different sets of options that could solve the plan, but at different cost and with different benefit values.

8.5.1 Resilience

We want to plan to be resilient to future uncertainties, and so through WRSE, a resilience framework was developed through which we can review our plan to ensure it provides resilience benefits in terms of both water supply and the natural environment. This is described in the WRSE resilience framework method statement. Resilience has been assessed in terms of:

- The baseline public water supply system.

- An assessment of the feasible options in terms of how and whether they provide resilience benefits.
- Assessments of alternative plans as part of the best value assessment.

A range of resilience metrics were identified and reported through WRSE. These have been combined to provide an aggregate score for each option assessed.

A key feature of this plan has been to improve the resilience of the South East to drought events. On the recommendations of the National Infrastructure Commission (NIC) (Preparing for a drier future, 2018), and in accordance with the WRPG, we plan to reduce the risk of needing to implement emergency drought orders (such as rota cuts or standpipes) to no more than once in every 500 years on average.

In accordance with the WRPG, a transitional period is allowed to move from planning to a level of 1-in-200 year drought events in the previous plan, to 1-in-500.

We aim to achieve system resilience to 1-in-500 drought events by 2038-39, in accordance with the wider WRSE region. A range of assessments were undertaken for the WRMP24 by WRSE to determine the optimal point in which we switch to a 1-in-500 system resilience. Meeting the standard earlier requires more infrastructure to be developed in order to meet the shortfall so there are increased pressures on customer bills in the short term. Delaying meeting a 1-in-500 does not delay the need for key strategic schemes within the WRSE region. WRSE updated the analysis we undertook at the draft plan stage, and we still concluded that meeting this standard of resilience by 2039 represents the best timing. Further information is presented in Appendix 9A.

8.5.2 Drought permits and orders

Supply-side drought permits and orders can be used in severe droughts by allowing additional abstractions from certain sources, provided the permit or order is approved. This is a key component of drought management.

As we move towards increasing the resilience to droughts, the plan also considers that these supply-side options would remain available in very extreme droughts (i.e. of 1-in-500 year return period) but would aim to use them only where necessary and only use the permits or orders which are deemed to have the least potential to harm the environment.

Demand-side 'ordinary' drought orders (TUBS and NEUBs) are assumed to be available throughout the plan in accordance with the planned levels of service agreed with our customers.

It is important to keep the use of permits and orders as a measure companies can adopt, to reduce the risk of the potentially more significant need for emergency drought orders such as rota cuts and standpipes, which are generally considered unacceptable to customers.

8.5.3 Water saving policies

There may be a range of policies which influence the best value plan. Some policies will be implemented because they align with government policy and/or aspiration for society as a whole, and so are viewed as 'constraints'. While others can be considered as 'options' because they provide some benefit (increased supply or reduced demand for water) that help to solve the planning problem we face, and so can be assessed for best value alongside other resource development options. This sub-section sets out some of the policies that have been included within the best value adaptive plan.

8.5.3.1 Level of leakage

We have, along with all the companies in the WRSE region, committed to reducing leakage by 50 percent by 2050 (from the levels seen in 2017/18, which was 32.38 Ml/d). However, based on customer support we now plan to exceed this target and to meet it in 2040, 10 years ahead of schedule. The successful delivery of this policy, which is reflected in the baseline supply demand forecasts, will be kept under review on a regular basis to check whether it has been possible to successfully deliver the reductions.

Post-2040, where there are further leakage reduction options, these are considered in the conventional way against other options in the investment model.

8.5.3.2 Customer Demand Reductions

The EIP details a range of demand reductions required for households and non-households, this includes meeting a 110 Per Capita Consumption (in a dry year) for households and a 15% reduction in non-household demand by 2050. These targets have subsequently informed a range of demand reduction option which are needed to meet these targets. Achieving this relies on successful and timely interventions by the Government for government policy around labelling white goods and tightening of building regulation to bring demand reductions.

This assumption of government intervention, along with the Portsmouth Water 'High Plus' demand management basket (with universal metering) in the best value plan would allow us to get below an average of 110 litres per person per day across our supply area (as a dry year) by 2050.

8.5.3.3 Level of metering

To aid reductions in PCC and leakage, it is beneficial if all households are metered. This allows customers to make informed choices to adjust their water using behaviour as well as providing insight into levels of customer-side leakage. Typically, we see metered customers use less water than unmetered customers.

Because the South East is designated as an area of serious water stress, we can propose universal metering of all households. We have included a 'High Plus' demand management option to test a universal metering policy as part of our assessment of best value. This would see us achieve smart meting roll out by 2035 for households and non-households.

8.5.4 Environmental destination

We believe there is a widespread desire from our customers and stakeholders to protect our environment and enhance the resilience of the natural environment. This may include reducing our abstractions from existing water sources (rivers and groundwater) where there is a risk that the level of abstraction could cause unacceptable harm, particularly during drought events.

There is already an extensive programme to investigate the impacts of current abstractions through the Water Industry National Environment Programme (WINEP). To date, these have tended to look at priority sources in 5 year blocks.

However, in future, reductions to abstraction may need to go further, and so for this round of planning, longer-term environmental destinations (with licence capping) have been considered, to provide a longer-term view and an indication of what further reductions would mean in terms of investments. The scale of possible further reductions (beyond those identified in the WINEP investigations to date) could be very significant for us, although there is a great deal of uncertainty attached to the long term estimates.

Several environmental scenarios have been identified and agreed between the companies comprising WRSE, and we have fed our assessments into this process. These scenarios are one of the key factors examined in the adaptive pathways. Further information on our approach to environmental destination (with licence capping), is provided in Section 5.4 (with further detail provided in Appendix 5B).

8.5.5 Environmental assessments

Environmental assessments were conducted in accordance with the WRSE method statement and in line with appropriate guidance for each assessment type. These covered assessments of each option, informing the development of the feasible options set, and an environmental review of shortlisted programmes of options.

This considers and compares the selection of specific options in terms of their environmental and social issues or benefits, to allow the selected programmes of options to maximise benefits, or to mitigate or minimise environmental risks or concerns where possible.

A cumulative assessment of the in-combination effects of options selected in a given programme was also conducted by WRSE to consider whether the combination of options may contribute to more severe concerns for a sub-region or WRZ.

8.5.6 Stakeholder and customer engagement

The process for stakeholder and customer engagement was described previously in Section 3 of this WRMP24. This includes engagement with regulators during the development of this WRMP24 and in the development of the emerging and revised draft regional plans.

The outcomes of the consultation (as detailed in Section 3) demonstrate strong support for our demand reduction strategies and balance between supply and demand. In addition, customers overall found the dWRMP24 bill impacts were affordable. Therefore, there was no reason to materially adjust the plan for the final WRMP24. The consultation highlighted customers have concern due to the linkages to Southern Water's HWTWRP and the interlinks to our supply network. As detailed in Section 7.8, we will continue to work with Southern Water to alleviate customers concerns regarding the option. We will also not continue to support the scheme if we have any concerns about the risk to public water supply.

8.5.7 Ofwat's public value principles

The Ofwat public value principles are well aligned with the approach undertaken for Best Value Planning. WRSE created a set of plans which deliver beyond our statutory obligations and benefit residents, customers and the natural environment. We and WRSE have been engaging with regulators and stakeholders continuously throughout the process of forming our WRMP24 to maximise and optimise the value achieved and ensure customer support for our plan.

8.6 Stress testing the plan – "what if?"

To ensure that the solution is robust to future uncertainties, scenario and sensitivity analysis was undertaken. This is described in more detail in Section 9. Through this performance testing analysis, we are typically examining 'what if?' questions.

Through the adaptive planning process, we already cover many of the 'what if?' questions relating to uncertainties in forecasting supply and demand components, such as population growth, customer behaviour, impacts of climate change, impacts of environmental destination on the available sources.

The stress testing can help to identify and finalise triggers and timing for the final adaptive pathways used for the preferred plan. In this way, the whole process is iterative, involving multiple reviews and feedback mechanisms.

Section 9 of this WRMP24 describes the scenario and sensitivity testing carried out as part of the WRSE investment modelling, and its relevance to us in deciding our preferred best value plan. A series of comparisons for different objective functions is used to assess the relative merits of difference scenario and sensitivity runs.

Such runs can help to identify alternative programmes of options.

8.7 Our preferred plan – an adaptive best value plan

As described previously, we have taken the outputs from the WRSE regional investment model, which solves the regional planning problem, and have reviewed and refined this where necessary to reflect the preferred plan for our customers. The plan produced by WRSE demonstrates alignment to the key factors in deriving the best value plan and also shows a consistent selection of options throughout various plans and scenarios.

As described in the WRSE method statement (Appendix 8A), there is an iterative process involving the selection of the preferred plan, with provisional plans reviewed by the water companies to allow us to assess the plan at WRZ level and submit proposals for minor amendments where appropriate. Minor changes are driven by WRZ-specific factors and with practicalities of delivering the plan in a timely fashion.

This iterative review phase also involves a review of the adaptive pathways and in particular the key decision dates for delivery of the plan, ensuring they are clear, practical and achievable, and that suitable monitoring can be implemented to assist the identification of when a change to an alternative pathway needs to be triggered.

In our preferred best value plan presented in Section 10, we have only reported on those options and activities that directly relate to our supply area. This includes any regional schemes that may also provide additional resilience or other benefits to our supply area.

The following subsection details the comparison to the alternative plans and programmes considered for the WRMP24 and why the best value plan was selected. Further detail on our best value plan is also provided in Appendix 8A.

8.7.1 A comparison of plans and programmes – comparison of options

This following section presents an overview and comparison of the range of plans considered for the WRMP24. This includes a comparison against the Least Cost Plan (LCP) and the Best Environmental & Societal Plan (BESP), against the Best Value Plan (BVP). These are two alternative plans which WRSE is specifically required to present, through guidance in the WRPG.

The LCP is the plan which the WRSE investment modelling determines is the least overall cost. The investment model was run to select a least cost plan by only using the cost information to optimise the solution and does not optimise on the best value metrics.

The BESP is the plan which the WRSE investment modelling determined has the highest metric score when optimised on the environmental and customer preference metrics. It therefore does not try to improve the resilience metric scores in the plans.

Our best value plan delivers additional value over and above that which would be delivered through our least cost plan. The best value plan achieves greater resilience and overall best value when compared to the best environmental and societal plan.

The comparison of options between plans is summarised in Table 45. The results show that for the whole planning period the selection of options is consistent. This largely results from the requirement of demand reductions to meet the EIP targets.

The optimisation of the BVP (seeking an improvement in the BVP metrics) is undertaken at a WRSE level, not a WRMP level. Table 46 presents a comparison of metrics between the LCP, BESP and the BVP. There is very little difference between these three plans, both in terms of costs, metrics and strategic scheme selection. As you would expect, the LCP scores worse on Environment, with the BESP scoring the highest for environment and society with the BVP generally in the middle. The consistency of the selection of options gives confidence in the option selection process for our plan.

Our WRMP24 planning tables (Table 7 and 8) show further comparison of the plans and programmes in terms of options selected and the costs of programmes.

Table 45: Comparison between options selected between Least Cost Plan (LCP), Best Social and Environmental Plan (BSEP) and Best Value Plan (BVP)

Option Name		LCP	BESP	BVP
'High Plus' demand basket (including demand reductions, leakage and Government led interventions)		2025-26	2025-26	2025-26
Non-essential use bans		2025-26	2025-26	2025-26
Temporary use bans		2025-26	2025-26	2025-26
Drought Permit: Source S		2025-26	2025-26	2025-26
Upgrade Source O Booster to 25Mld		3033-34	2034-35	2033-34
Import from Southern Water: Potable Resource for Otterbourne WSW to Source A (Import of potable water from Southern Water (SWSHSE) to the west of our supply area)		2039-40	2039-40	2039-40
Works A treatment capacity increase to treat and distribute water from Havant Thicket Reservoir	Works A increased treatment capacity and pipeline (phase 1)	2046-47	2046-47	2046- 47
	Works A increased treatment capacity (phase 2)	2048-49	2048-49	2048-49
New treatment works at Service Reservoir C to treat and distribute water from Havant Thicket Reservoir	New treatment works at Service Reservoir C and pipelines (Phase 1)	2049-50	2051-52	2049-50
	Additional treatment capacity at Service Reservoir C (phase 2)	2063-64	2061-62	2069-70

Table 46: Comparison of metrics between the Lest Cost Plan (LCP), Best Social and Environmental Plan (BSEP) and Best Value Plan (BVP) at a WRSE regional level

Metric	LCP	BSEP	BVP
Environmental Benefit (%)	22	85	57
Environmental Disbenefit (%)	54	72	77
Natural Capital (%)	33	92	60
Biodiversity Net Gain (%)	45	75	36
Customer Preference for Option Type (%)	28	75	87
Reliability (%)	32	56	54
Adaptability (%)	27	63	39
Evolvability (%)	27	84	56
Environmental & Societal	36	69	63
Environment	39	81	58
Resilience (%)	29	84	50
BVP Weighted (%)	35	72	57
BVP Weighted Situation 4 (%)	17	68	48
BVP Unweighted (%)	34	68	58
Customer Preference Score (%)	76	90	79
Average Cost (£m)*	17824	17769	18119
Capex (STPR) (£m)*	4648	4624	4818
Opex (STPR) (£m)*	11882	11826	11984
*programmes were optimised at the regional level and therefore costs for each programme at the WRSE regional costs.			

9 TESTING THE PLAN

9.1 Introduction

This section, and the accompanying Appendix 9A, sets out how we tested the sensitivity of our best value plan against changes to the data used in the WRMP and what insights this provided about the resilience of our best value plan.

After considering potential risks to the plan including population growth, climate change, sustainability changes, resilience, risk profile and delivery of our preferred programme, we have selected appropriate sensitivity tests to understand and identify strategic alternative schemes or plans. Additional sensitivity tests have been completed based on regulator feedback.

The decision-making approach already adopts an adaptive planning approach, solving nine different plausible future scenarios simultaneously relating to the impacts of population growth, climate change and environmental destination on forecast demands and the availability of water resources. Some degree of testing is therefore inherent through that adaptive planning process. This has been described previously in Section 2.

The purpose of this section is to explain how we stress tested the plan for a range of other "what if?" scenarios, to ensure it is as robust as possible. By demonstrating the resilience of our best value plan to a range of sensitivity tests we confirmed the decision that our best value plan is also our preferred plan for WRMP24.

As described previously, the investment modelling was carried out at the WRSE regional level. The range of assessments and scenario tests has been used to inform the development of best value through the regional planning group. All the contributing water companies have been involved in reviewing and challenging the outputs, and identifying key scenarios for testing, so that, across the region, we can be confident in our plan.

This Section describes our approach to stress testing and for our customers how the outputs have informed the derivation of our preferred plan. We also provide commentary around the implications of some of the regional schemes for our supply area.

Our preferred best value plan is described in in Section 10.

9.2 Stress testing

We have identified a number of key areas of stress test relevant to our WRMP24. These include the following:

- Demand management: achieving lower reductions than forecasted;
- Environmental destination / time limited licence variations: implementing licence reductions earlier in the planning period reflecting loss of time limited licence variations (a proxy for bringing forward the environmental destination);
- Drought demand options: achieving lower demand reductions than forecasted from Non-Essential Use Bans (NEUBs) and Temporary Use Bans (TUBs) during times of drought;
- Bulk supplies with neighbouring water companies: capping exports during non-drought periods;
- Delays to the implementation of our Havant Thicket Reservoir and Southern Water's HWTWRP scheme;
- Drought Permit option benefits: not obtaining the expected yield; and
- Source O Booster Upgrade: impact of not implementing this option.

Many other stress tests have been applied during development of the regional plan. These key areas were chosen to test how resilient the best value plan is by assessing how it performs if our planning assumptions turn out to be very different to our expectations.

Table 47 presents the sensitivity tests that were carried out, what the impact on the outputs of the regional investment modelling were, and what insight this has provided about the resilience of our best value plan, which includes the following key elements:

- High levels of demand management, more than meeting the requirements of Defra's Environmental Improvement Plan
- Use of our planned Havant Thicket Reservoir (2031/32)
- Southern Water's use of our Havant Thicket Reservoir with their Hampshire Water Transfer and Water Recycling Project (HWTWRP) to provide significant additional regional benefits.
- Net exporter of water at the start of the planning period, becoming a net importer of water later in the planning period.

Table 47: Sensitivity runs, and what their results have told us about the best value plan

Stress Test Number	Description of sensitivity test carried out	Why we chose this sensitivity test	The key features from this run on the best value plan	What this told us about the resilience of our WRMP24.
1	We tested the plan with lower assumed demand management savings. We achieved this by assuming limited benefit from demand reductions from Government led interventions	This tests the resilience of the plan if the Government doesn't introduce mandatory water labelling or if demand reductions don't arise.	More water would be imported from Southern Water to Portsmouth Water.	The impact of a reduced water saving from demand management is that we are in a less strong position to support our neighbours and are likely to rely on imports from Southern Water under high environmental destination– so are more reliant on the development of Southern Water and Thames Water strategic resource options.
2	Earlier Environmental Destination A sensitivity test was undertaken to test if the proposed abstraction reductions ('sustainability reductions') could be brought forward by assuming that our current time limited licence variations are not renewed. We applied a 17 Ml/d sustainability reduction from 2028-29 associated with the non-renewal of time limited licence variations, which effectively brings forward possible reductions under the environmental destination.	Environmental destination is a dominant and significant driver of potential deficit over the planning period. The test was required based on regulatory feedback and if environmental destination could be brought forward.	This scenario solved within the model (i.e. water could be moved around so that the balance of supply and demand was maintained). However, this was only achieved by decreasing treated water exports to Southern Water with an equivalent increased reliance on Southern Water drought permits and orders to take more raw water from the Rivers Itchen and Arun.	This tells us we are not able to deliver these reductions sooner. We have provided further detail in Appendix 5B on how we intend to manage risk and avoid any deterioration in environmental status.

Stress Test Number	Description of sensitivity test carried out	Why we chose this sensitivity test	The key features from this run on the best value plan	What this told us about the resilience of our WRMP24.
3	We tested reduced demand saving from drought demand options (Temporary Use Bans and Non Essential Use Bans) The benefit of the options dropped to 50% once the smart metering roll out is complete (post 2035).	This test was conducted based on regulatory concern that a static profile of benefits is considered in the plan.	The model run did not solve, although deficits only appeared in the extreme adaptive planning situation 1 towards the end of the plan. Under the preferred plan scenario (situation 4) the selected investments were brought forward.	This confirms that our plan is very dependent upon the demand options proposed and that there are no alternative supply schemes within our supply region.
4	Capping exports to Southern Water at 2.5 Ml/d in a normal (non drought year) to minimise the risk of growth in abstraction which could result in a deterioration in environmental status, such as Water Framework Directive. 2.5 Ml/d reflects recent actual exports to Southern Water.	This test was undertaken following regulatory feedback that the exports to Southern Water may lead to environmental deterioration due to growth in abstraction.	The model struggled to solve in the Hampshire Region with deficits in the early period of the planning horizon. This suggests it may not be possible to cap exports to recent actual in a normal year.	The sensitivity testing indicates that abstractions and exports will need to be carefully managed to mitigate the risk of water body deterioration during AMP8. We will work with Southern Water and the Environment Agency to achieve this and will be a parameter we monitor in our monitoring plan (Appendix 10A). We will also report upon the bulk exports annually to regulators via the WRMP Annual Return.

Stress Test Number	Description of sensitivity test carried out	Why we chose this sensitivity test	The key features from this run on the best value plan	What this told us about the resilience of our WRMP24.
5	Based on consultation feedback on the dWRMP24 we have added a new sensitivity test which assumes a lower benefit from Source S drought permit. This included reducing the benefit to 50% and excluding the option from the model. This scenario was to test the reliance upon the option and the yield assumptions.	Regulatory concern the yield benefit of the option may not be possible.	Both runs failed to solve, demonstrating our reliance upon this option at the start of WRMP24 to maintain resilience to extreme drought. A single year (2025-26) with a deficit appeared in both the '50%' benefit and 'exclude' runs, with a magnitude of 1.7 Ml/d and 3.4 Ml/d, respectively. In later years the loss of part or all the drought permit is replaced by bringing forward the implementation year of the Source O booster upgrade to release conjunctive use benefits associated with Havant Thicket Reservoir; from 2033-34 to 2032-33.	To mitigate losing part or all the Source S drought permit, we would seek immediate implementation of 'More Before 4' actions in our 2022 Drought Plan. We will investigate these options further in the development of our next drought plan. We will also reassess the benefits of implementing the Source O booster upgrade in an earlier year as part of our next WRMP (WRMP 2029). As detailed in Appendix 5B (section 2.3 and 3.3) we will be undertaking further investigation on the yield and potential environmental effects of this option.
6	Assume Source O Booster Upgrade is not available.	To aid in environmental assessment of the Preferred Plan.	The model brought forward some of the 2040s treatment works options by one or two years. Overall, there are no significant impacts on the plan.	The stress test demonstrated that overall, there are no significant impacts on the plan. The results will be considered when reporting on the

Stress Test Number	Description of sensitivity test carried out	Why we chose this sensitivity test	The key features from this run on the best value plan	What this told us about the resilience of our WRMP24.
				environmental assessments for the WRMP24.
7	Delay Havant Thicket Reservoir implementation year up to 2034-35.	To help demonstrate that our own plan is not at risk if the Havant Thicket Reservoir Scheme is delayed.	The solution had no material impact on the supply demand balance for Portsmouth Water during the period 2031-32 to 2033-34, because a delay in implementing the reservoir consequently delays the 21 Ml/d export to Southern Water's Hampshire Southampton East (HSE) zone.	The test demonstrates we are resilient to delays in the Havant Thicket Reservoir scheme.
8	Delay Southern Water's Hampshire Water Transfer and Water Recycling Project implementation year up to 2039-40.	To help demonstrate that our own plan is not at risk if the Southern Water HWTWRP Scheme is delayed.	The sensitivity test had no material impact on the supply-demand balance for Portsmouth Water during the period 2034-35 to 2038-39.	The test demonstrates we are resilient to delays in the HWTWRP scheme.

Interpretation of the stress test outputs shows that our plan is robust in the face of the uncertainties examined. Selection of the same options under different stress tests demonstrates the stability of our plan.

The results indicate that no key alternatives are required in our plan for WRMP24. However, the longer term strategy may be impacted if the Southern Water HWTWRP is not deliverable – an alternative strategic option or options will need to be developed by Southern Water. Our Havant Thicket reservoir is a key part of the Southern Water strategic reuse option and contributes significantly to the resilience of our plan.

Furthermore, the results show that the impact of reduced water saving from demand management is that we are in a less strong position to support our neighbours, and are likely to rely on larger imports from Southern Water. Therefore, we become more reliant on the development of Southern Water and Thames Water strategic resource options. This re-enforces the need for us to explore more options in WRMP29.

The outcome of many sensitivity tests demonstrate we will need to consider alternative (earlier) implementation dates of supply schemes, in particular, Source O Booster Upgrade.

The results also indicate that once Southern Water and Thames Water have strategic options in place, we are in a position to reduce or cease our bulk supplies to our neighbours. In addition, we are reliant upon drought permit options but only in the first year of the plan.

Our Monitoring Plan (Appendix 10A) details how we will monitor and track each element of our plan, including demand reductions to highlight if any significant risks are emerging. This would be reported via the WRMP Annual Review.

10 OUR PREFERRED BEST VALUE PLAN

10.1 Summary of our preferred best value plan

This section draws together the findings from each of the previous sections and presents the details of our preferred best value plan to increase resilience to drought events and maintain the supply-demand balance across our supply area over the 50-year planning period from 2025–26 to 2074–75.

Our preferred plan resolves the supply-demand deficit identified in Section 6 using the feasible options identified in Section 7. Section 8 describes the process of developing this plan, and Section 9 describes the sensitivity runs that tested the resilience of this plan.

Our preferred plan is based on pathway / situation four of the adaptive planning pathways described in Section 2. This is based on local authority housing plans, CC06 (higher) climate change forecasts and prepares for a high level of impact on our existing supplies to deliver environmental ambition and cap existing abstraction licences at recent actual levels. We have worked collaboratively across the South East region and, to an even closer extent with our neighbour Southern Water in the development of this WRMP. This is in addition to our existing operational relationship around our ongoing existing bulk supplies, and their role as wastewater operator across our supply area. We fully intend this collaboration to continue.

Our WRMP24 preferred best value plan consists of the following components:

- **Starting in 2025–26**: Implementation of the 'High Plus' basket of demand management measures which aims to reduce leakage by 50 per cent by 2040 and overall customer demand for water by around 26 per cent by 2050 compared to 2021–22 levels. This basket of measures includes universal household and non-household 'smart' metering over 10 years starting in 2025–26. Existing 'dumb' meters will also be either upgraded or replaced with smart meters, ensuring that to the extent that it's practically achievable, by 2035 every household and non-household meter will be smart. By 2034–35 we expect that 94.7 per cent of the households we serve will have a meter, compared with 34 per cent in 2021–22. Installing 'smart' meters will deliver additional benefits to reducing water demand, as the data from the meters will help reduce leakage inside and outside properties and improve the quality of our customer engagement. These demand reductions are profiled to aim to meet the EIP targets for demand reductions for leakage, households and non-households.

  To optimise the effectiveness of our own water efficiency efforts, our best value plan assumes that the Government will introduce mandatory water labelling for white goods and strengthen water regulations standards to improve water efficiency in homes. This assumption has been applied consistently across the WRSE regional planning area and discussed with regulators. Other key assumptions and outcomes include:

- **From 2025-26 and 2038-39:** Our levels of service for Emergency Drought Orders (i.e. rota cuts) will remain at 1-in-200 during this period, increasing to 1-in-500 from 2039 onwards. This increases the deployable output available to us during this period.

- **From 2025–26 until 2040–41**: When required in extreme events, the continued use of existing drought schemes in accordance with our drought plan (Temporary Use Bans, Non-Essential Use Bans and our supply-side Source S drought permit). Beyond 2040-41 the Source S drought permit is no longer used, although the implementation of Temporary Use Bans and Non-Essential Use Bans is continued.

- **From 2025–26**: Continued provision of existing and planned bulk supplies to Southern Water, including from Havant Thicket Reservoir. This involves providing up to a 15 Ml/d

transfer to Southern Water at our eastern border and providing up to a 15 Ml/d transfer to Southern Water at our western boundary from 2029, rising to a 51 Ml/d capacity transfer by 2031-32 (once Havant Thicket Reservoir becomes online). The actual transfer rates vary throughout the planning horizon depending on the amount of water we have available for transfer and the needs of Southern Water. Since the dWRMP24 we have agreed with Southern Water to minimise exports in a normal (non-drought year) in order to minimise abstraction from our chalk aquifers to reduce the risk of Water Framework Directive related deterioration in water body status.

- **By 2034**: A network enhancement to improve the way we can move water resources around our supply area (unlocking conjunctive use benefits associated with Havant Thicket Reservoir, once operational). This option was also selected in the dWRMP24.

- **By 2040**: A bulk import of potable water from Southern Water to the west of our supply area. This represents a reversal of flow in the existing and planned bulk supplies to Southern Water. Once Southern Water has more water in Hampshire through the delivery of a supply development detailed within the WRSE revised draft regional plan and Southern Water's rdWRMP24, we would be able to start receiving supplies from Southern Water to support our own supplies in future. This option was also selected in the dWRMP24 but is now selected around 8 years earlier.

  The South East Strategic Reservoir Option (Sesro) provides water to Thames, Southern and Affinity in the WRSE regional best value plan during different conditions. We also get an indirect benefit from Sesro in the preferred plan, as we become a net importer of water from Southern, who in turn get their water from a combination of Sesro (via the Thames to Southern transfer) and the Hampshire Water Transfer and Water Recycling Project (HWTWRP).

- **From 2047 onwards:** Further into the planning period there is a need for further interconnectivity and treatment capacity to transfer and treat water across our supply area to utilise the water most effectively from Havant Thicket Reservoir. In the dWRMP24 these options were not selected in the preferred pathway but now feature in the preferred plan due to the need to find additional water resulting from higher sustainability reductions.

  The plan suggests the scale of this need would require up to 20 Ml/d of additional treatment works capacity at Works A WTW from the mid to late 2040s and a new 10 Ml/d WTW at the location of service Reservoir C from the early 2050s. These options are predicated on the prior construction of the proposed HWTWRP scheme for Southern Water.

  To support this extra demand the plan suggests the reservoir could need additional recycled water to be added, meaning the water taken would be blended reservoir water (i.e. with contributions from rainfall, recycled water and spring water). Portsmouth Water will seek to remove this dependency in the next water resources management plan (WRMP29) via the consideration of new options (for reasons set out in the next paragraphs), although the need for recycled water in a drought is expected to remain.

Our WRMP24 plan is reliant on Southern Water's forecast demand reductions (which would allow them to provide a future bulk supply to us) and the development of their HWTWRP which would allow us to abstract and treat more water from Havant Thicket Reservoir in the future.

From the consultation responses, we understand that some customers have concerns about Southern Water's HWTWRP which forms part of Southern Water's WRMP24. We take these concerns very seriously and value the trust of our customers and stakeholders. We have

committed initial support to Southern Water as they develop the details of this option; however, we will withdraw our support to the scheme if we have any doubt over the safety of this water, or the impact it might have on the environment and leisure facilities at Havant Thicket Reservoir. We will also consider the views of our customers and local stakeholders in the review of our support of the option. Further information can be found in Section 7.8 of the main statutory plan.

This WRMP24 fully aligns with the outcomes of the WRSE revised draft regional plan and aligns with the stated preferences of our customers in engagement work we have undertaken to date both through the WRSE and directly.

10.2 Selecting our Preferred Plan

This Preferred Plan has been developed and proposed through our participation in the regional planning process.

We have developed data inputs to the regional plan modelling, contributed to developing and approving the approaches and methodologies used. We have participated in the discussions and approval process for developing the Plan. Key decision points were discussed and agreed as a regional group via vote.

Section 8 sets out the decision-making process for this Preferred Plan, based around core metrics, regulatory requirements and stated government preferences. The timing of delivery of the options and other measures in the Preferred Plan has been optimised to balance customer and environmental resilience with the affordability of the programme and deliverability of supply and demand schemes.

Section 9 described how we used the regional modelling process to test the sensitivity of the plan to some alternative scenarios based upon what were considered the main areas of uncertainty around supply and demand. The testing demonstrated the resilience of the Preferred Plan to a range of risks, including possible future sustainability changes. We believe the plan is robust to minor changes in supply and demand forecasts in the near future and moderate changes as the plan progresses.

Compared to the dWRMP24 there are no significant changes in the options selected, with the first 15 years of the plan being dominated by demand reductions. As a check that we had confidence in the regional draft plan provided, we have discussed the plan with our regulators and key stakeholders and compared the results with the findings of our customer research and our SEA. We are satisfied that there is no reason for us to challenge the regional plan based on our customer research.

The SEA and HRA have informed the options selected in the preferred plan. The assessments undertaken have been consistent in approach and resulted in iterative development of the Plan, thereby allowing the Plan to be developed in the context of a thorough understanding of the key environmental issues and constraints of the Portsmouth Water area and beyond. This allowed for identification of a Preferred set of Options that preform best against the SEA objectives. In addition, it has been identified that environmental improvements can be delivered in many areas through scheme design and catchment management.

10.3 Our Preferred Plan

We consider the options presented here to be the most appropriate to adopt over the next fifty-year planning period to maintain the balance between water supply and demand.

Our preferred revised draft plan is summarised in Table 48, outlining the selected options and their planned start dates.

Table 48: Our rdWRMP24 preferred plan

Component	Year first utilised in the Preferred Plan	Max Ml/d benefit delivered by option (DYAA)	Max Ml/d benefit delivered by option (DYCP)
Demand Basket "High Plus" comprising: Universal metering, and adoption of smart meters, Leakage reductions of 50 per cent by 2040 and Enhanced water efficiency activity	2025–26	The demand option increases each year. The cumulative saving is expected to be 62.22 Ml/d by 2049-50 for both annual average and critical period planning conditions.	
Upgrade to Source O Booster (including the conjunctive use option benefit)	2033-34	4.1 Ml/d in a 1-in-500 year event.	6.5 Ml/d in a 1-in-500 year event.
Bulk import of potable water from Southern Water (SWS HSE) to the west of our supply area (Otterbourne WSW to Source A)	2039-40	This option is first selected for use in 2039-40 as providing 25.25 megalitres per year under dry year annual average conditions. The volume gradually increases to 45 Ml/d from 2046-47 for the remainder of the planning period. This option is not needed during the critical period.	
Continue existing bulk supplies to Southern Water.	2025-26	This is the Portsmouth Water export to SWS SNZ and SWS HSE Zones. These exports are part of the baseline until 2025-26 and 2028-29 respectively, after which they become optional. Over the planning period exports gradually reduce and eventually becomes zero. This results from less water available in the Portsmouth Water supply network due to higher levels of Environmental Protection. The Havant Thicket Reservoir bulk supply of up to 21 Ml/d is maintained over the planning period in a DYAA and 18.1 Ml/d in a DYCP.	

Component	Year first utilised in the Preferred Plan	Max Ml/d benefit delivered by option (DYAA)	Max Ml/d benefit delivered by option (DYCP)
Supply side drought orders: Drought Permit Source S (to 2041)	2025–26	3.4 Ml/d in a 1-in-500 year event until 2040-41	3.8 Ml/d in a 1-in-500 year event until 2040-41
Temporary Use Bans (TUB's)	2025-26	13.5 Ml/d in a 1-in-500 year event	16.6 Ml/d in a 1-in-500 year event
Non Essential Use Bans (NEUB's)	2025-26	5.3 Ml/d in a 1-in-500 year event	7.4 Ml/d in a 1-in-500 year event
Change in the levels of resilience for Emergency Drought Orders (i.e. rota cuts) from a 1-in-500 to a 1-in-200 level of resilience	2025-26	8.8 Ml/d in a 1-in-500 year event (reduces slightly over planning period) until 2039-40	9.5 Ml/d in a 1-in-500 year event (reduces slightly over the planning period) until 2039-40
Additional treatment capacity of 20 Ml/d at Works A and additional pipeline to utilise water from Havant Thicket Reservoir. This includes subsequent upgrades to increase treatment capacity further.	2046-47	N/A*	N/A*
A new 10 Ml/d WTW at the location of Service Reservoir C from the early 2050s to utilise water from Havant Thicket Reservoir. This includes serval phased enhancements and upgrades.	2049-50	N/A*	N/A*
*The deployable output benefit for these scheme is captured via the HWTWRP raw water import into Havant Thicket Reservoir. These options allow the water to be treated and distributed to make use of the additional water.			

10.4 Options to reduce demand

While individual demand management options were identified and screened through our options appraisal process , demand reduction interventions (including leakage reduction measures) were included within the WRSE investment modelling as interdependent options due to the interlinked nature of the options (for example, Smart Metering allows the implementation of a range of other water efficiency options). This ensures that the scale of savings that can be achieved is aligned to the water resources problem faced and allows for potential efficiencies.

For the WRMP24 there is one combined strategy, known as the 'High Plus' Demand Basket which was used in the regional investment modelling. The 'High Plus' demand basket seeks to meet the targets for demand reductions. It includes universal metering, leakage reduction, household demand reduction and non-household demand reduction.

In overview the demand-side options meet the following demand reduction targets:

- **Households:** The 2050 target of a 110 (l/h/d) PCC as a dry year annual average but we do not meet all the interim targets due to a high PCC starting point. We are committed to meeting these targets and therefore will be reviewing options available in WRMP29. This may include inovative options such as the replacement of white goods and a level of service change to a 1-in-10 year TUBs (subject to customer consultation)
- **Non-households**: We meet the interim and 2050 demand reductions for non-households.
- **Leakage:** we meet the interim and long term targets for leakage reductions by 2040, 10 years ahead of the target.

Further information is detailed in Appendix 10B (Water Efficiency Strategy) and Appendix 10C (Leakage Strategy).

This basket of measures incorporates the universal compulsory metering of our customers in a programme starting in the first year of AMP8 (2025) and being delivered over a 10 year period (other companies in the South East have previously implemented universal metering and so this measure increases alignment across the water providers in the South East). The metering effort will be supported by the full range of supplementary activities to deliver the maximum reduction in demand, such as water use audits, the supply of water efficient devices, a leak repair policy and tailored messages to customers based on individual household usage.

The savings from these activities under the 'High Plus' demand basket were calculated for three planning conditions (NYAA, DYAA, DYCP). They are forecast to reduce the per capita consumption for our customer base below 110 litres per person per day in a dry year by 2050 and meet the non-household demand reduction targets.

However, to reach these national aspirations for domestic water use, and the 110 PCC in a dry year, it is expected that it will require, in addition to water company activity, government action to improve water regulations and introduce a mandatory water labelling scheme. An increasing saving over time has been included in our planning because of these anticipated government actions, however there is a risk that delay in implementation of these actions will result in the assumed savings not being achieved. These risks are allowed for in the adaptive planning approach.

Considering the 'High Plus' demand basket and the government led demand interventions in combination, achieves a forecast PCC of under 110 as a dry year by 2050. We are therefore forecasting to exceed the 110 PCC target.

This ‘High Plus’ demand basket is ambitious and will deliver a step change in water use across our supply area through working with customers to empower them to understand and manage their water use. It is also an important contribution to the delivery of the 2022 UK Water Efficiency Strategy[42].

The profiles of demand reductions (both company and Government led) and leakage reductions over the planning period are summarised in Figure 90 to Figure 92.

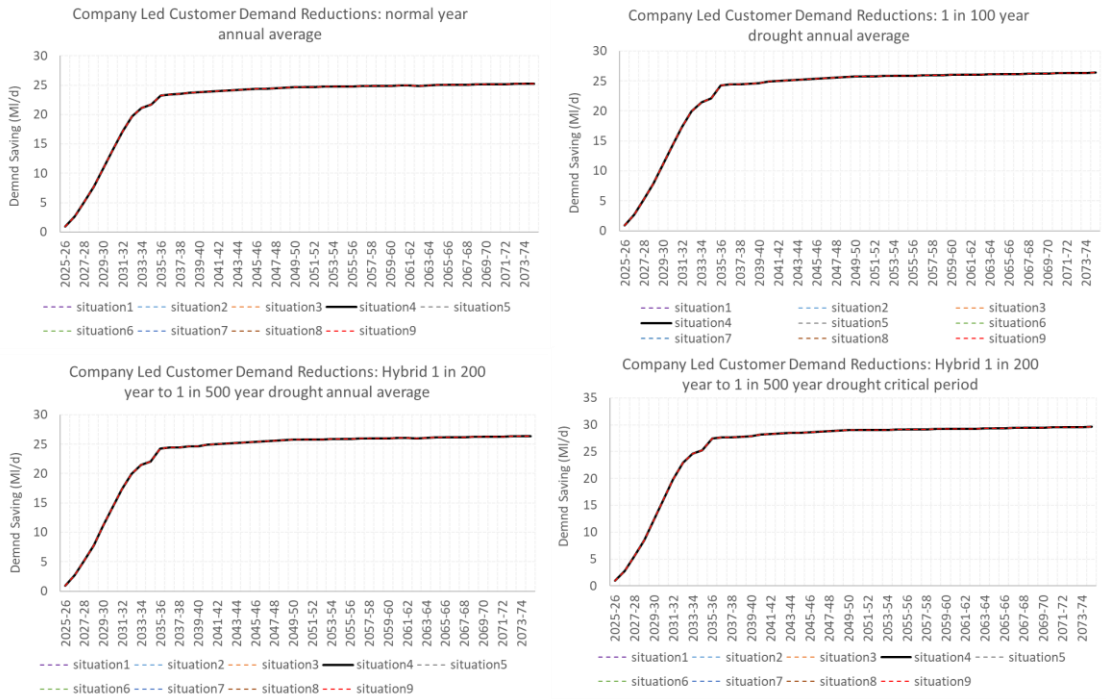


Figure 90: Profile of Company led demand reductions over the planning period

[42] UK Water Efficiency Strategy to 2030, Waterwise, 2022, www.waterwise.org.uk

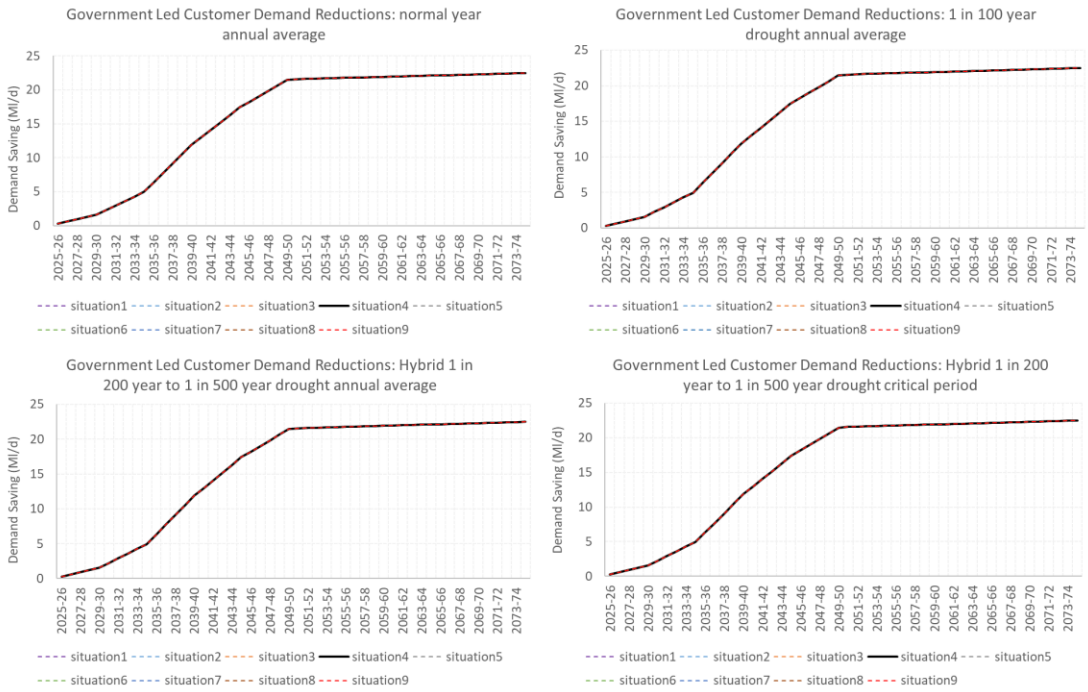


Figure 91: Profile of Government led demand reductions over the planning period

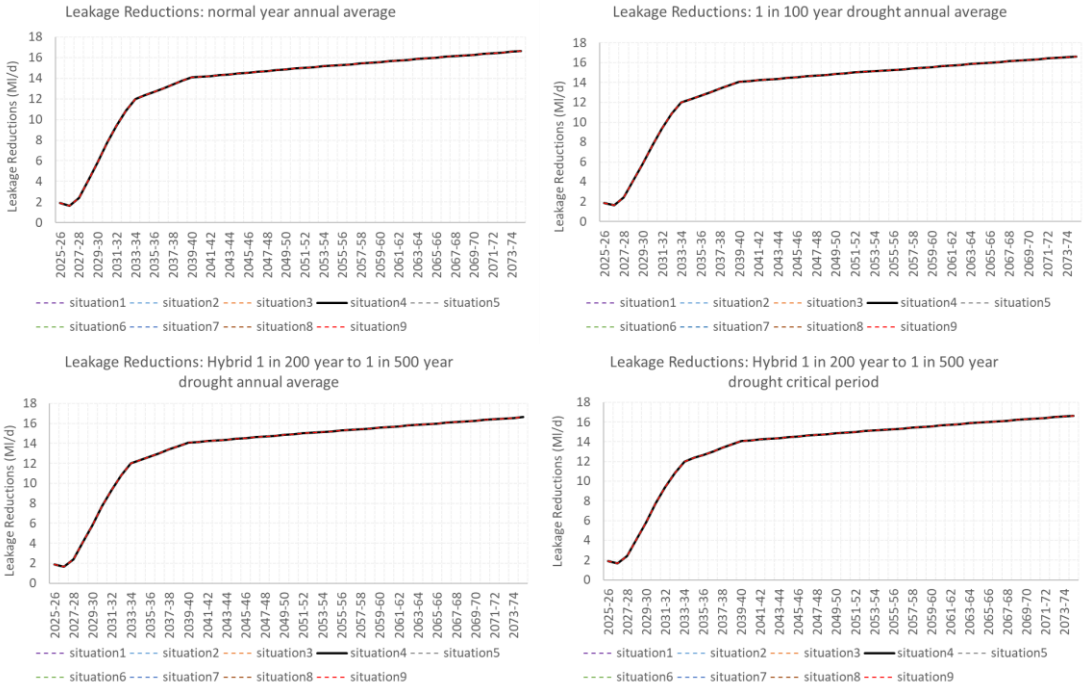


Figure 92: Profile of leakage reductions over the planning period

10.4.1 Leakage

Based on customer support we now plan to meet the 50% reduction in leakage (against the 2017-18 baseline) by 2040, not 2050. This is 10 years ahead of the national aspirations. We have undertaken leakage modelling to identify how we could achieve these reductions in the most cost efficient and optimal way.

We believe we would be able to achieve this largely through existing technologies, although at increased cost compared to current spend on leakage. This is because as leakage levels reduce the cost of further reducing leakage increases as the remaining leaks are harder to find. Progressively as overall leakage reduces, each leak is more resource intensive to find, and once fixed, saves a smaller volume of water.

Our Leakage Strategy Appendix (10C) details our plans for delivering these leakage reductions between 2025 and 2075. The core approached we will implement are:

- Find and Fix (ALC)
- Find and Fix – DMA Integrity Hyper Care (ALC)
- Trunk and rural mains strategy
- Project calm – network calming strategy
- Universal Smart Metering
- Smart networks – digital twin
- Mains replacement

We, and the water industry, are committed to finding more cost-effective ways to reduce leakage and are continuingly reviewing and implementing innovative technologies, to reduce the costs of reducing leakage.

We are also heavily involved in the development of the leakage road map, working with the rest of the industry.

10.4.2 Universal metering– delivered within 10 years.

Our plan assumes the installation of 352,000 smart domestic meters in the first 10 years of the planning period (in AMP8 and AMP9). This also includes the replacement of 'basic' meters with smart meters for all customers (households and non-households). This will be supported by a programme of communications and engagement to maximise water savings and support vulnerable customers to ensure water remains affordable for all.

This will provide additional service benefits in helping to identify customer supply pipe leaks and network operability, in addition to supporting customers to understand their water using behaviour and providing a financial incentive to save water.

This metering programme is anticipated to increase the company's overall level of meter penetration to 65.3 per cent by 2029-30 and to 94.7 per cent by 2034-35. This will bring our supply area in line with the metering penetration across the rest of the South East of England.

Appendix 10B provides further information about our plans for smart metering. Please refer to Section 4.5 and Annex 3 of Appendix 10B.

10.4.3 Water efficiency

Our 'High Plus' basket of demand activities, as currently conceived, aligns with the roll out of universal metering as well as supporting all existing metered household and non-household customers. It includes the following for household customers:

- Home water efficiency audits outside of the smart metering programme
- Education
- Community Reward Platform
- General broadcast messages (multi-channel proactive comms)
- Community campaign
- Leak Alarms (e.g., Leakbot)
- Universal smart metering
- Household flow reduction (pressure control)
- Household Incentives: Innovative tariffs

In addition to smart metering of non-households we will be working with retailers to deliver water efficiency support and audits for non-households.

Appendix 10B provides further information about our plans for water efficiency support for households and non-households. Please refer to Section 4.5 of Appendix 10B.

10.4.4 Temporary Use Bans (TUBs) and Non Essential Use Bans (NEUB's)

We will continue to implement TUBS and NEUB as per the Drought Plan 2022 over the entire planning period. These options would only be used in a drought years and would seek to reduce our customers water use. Further information on our use of these options can be found in our latest Drought Plan[43]

Figure 93 present the utilisation of TUBs NEUBs and TUBs respectively across the planning period for a range of return periods.

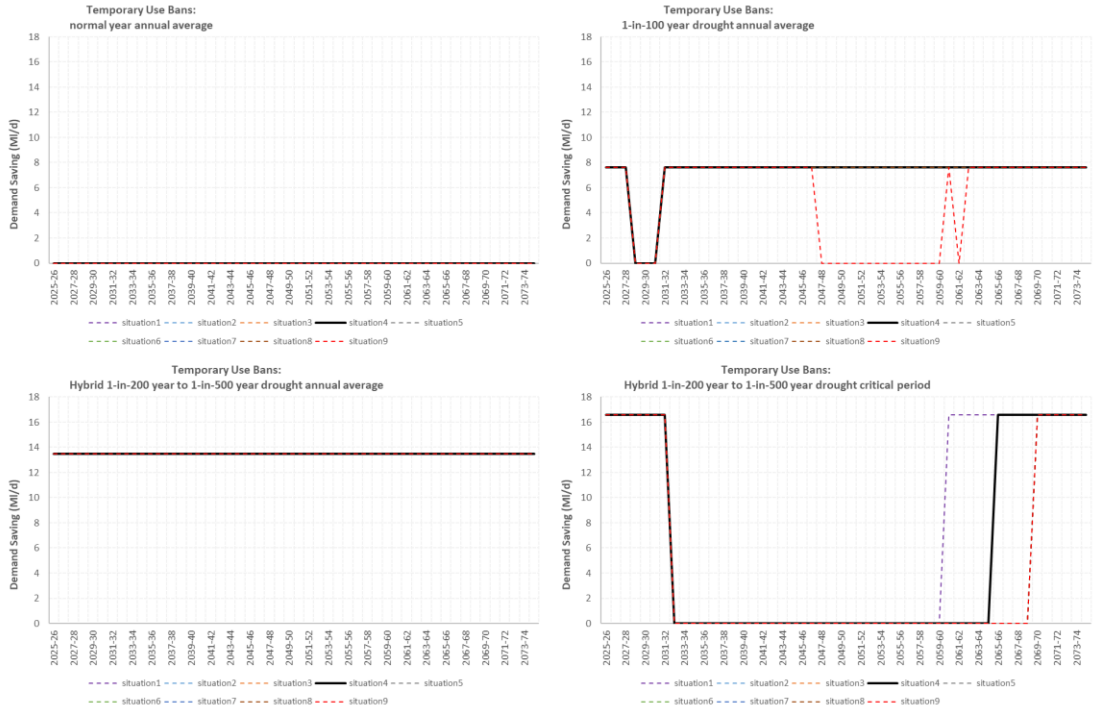


Figure 93: Temporary Use Bans (TUBs) utilisation across the planning period, by return period.

[43] https://www.portsmouthwater.co.uk/wp-content/uploads/2022/04/Final-Drought-Plan-2022.pdf

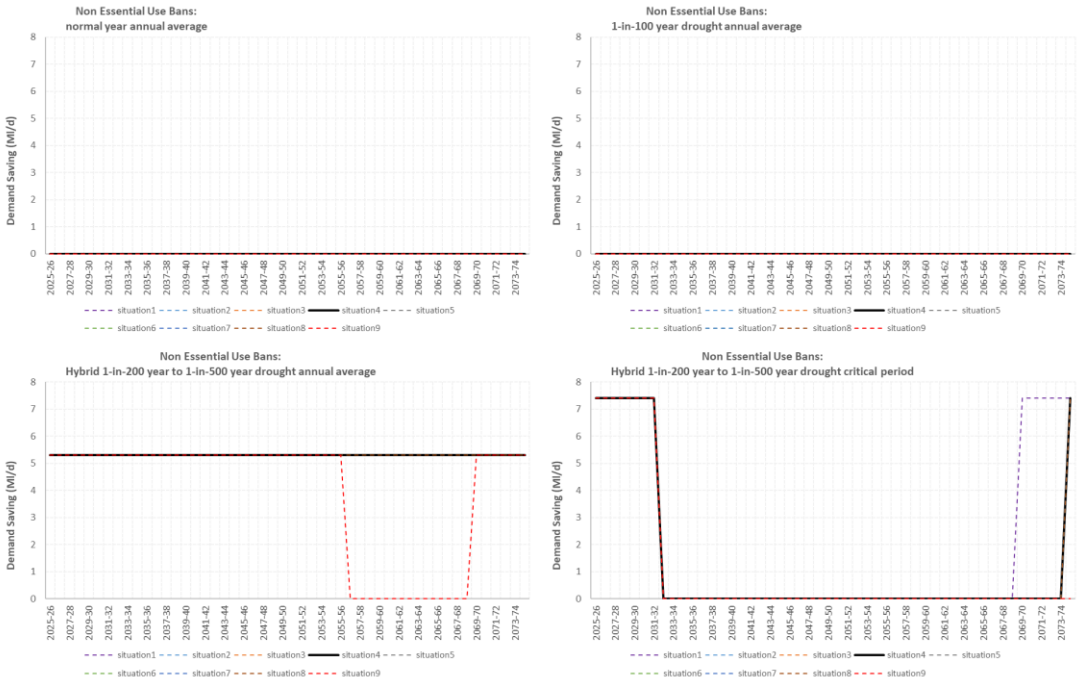


Figure 94: Non Essential Use Bans (NEUBs) utilisation across the planning period, by return period.

10.5 Options to improve supply

10.5.1 Upgrade to Source O Booster

This option was developed because of our recent Pywr water resources modelling to improve our understanding of how our system behaves against a wider range of stochastically generated climatic conditions. We have identified that by upgrading one of our network booster stations to increase the quantity of water we can move from one area of our network to another to 'unlock trapped deployable output' (conjunctive use with Havant Thicket reservoir). This booster upgrade improves the way we will be able to move water around our supply network when we need it most in dry weather events (i.e. moving water towards the east of the network).

The benefit of this option has been revised using the new Hampshire Pywr model. The other key change is that the option has no benefit in a 'normal', non-drought year. This is to conserve water within Havant Thicket Reservoir ahead of a drought. In a dry year, this option will provide an additional 4.1 Ml/d of supply benefit as an annual average. Figure 95 presents the utilisation of Source O across the planning period, by return period.

Figure 95: Source O Booster utilisation across the planning period, by return period.

10.5.2 Drought Permits: Source S

Between 2025-26 and 2040-41 we will seek to use a drought permit at Source S in drought conditions. This option will bring additional deployable output benefit. Figure 96 presents the utilisation of Source S across the planning period, by return period. Post 2040-41 the option is not planned to be used which aligns to Regulatory expectations that reliance on drought permits reduces overtime. Over AMP8 we will undertake further yield and environmental assessments for this option (as detailed in Appendix 5B).

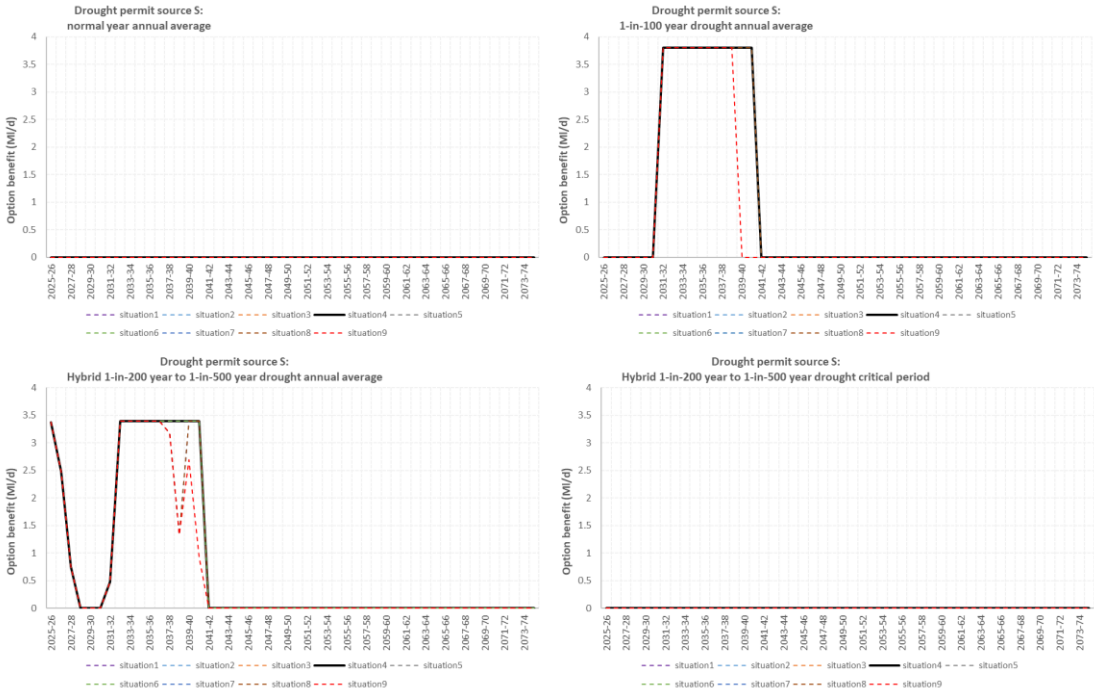


Figure 96: Drought Permit Source S utilisation across the planning period, by return period.

10.5.3 Bulk import from Southern Water to the west of our supply area

We currently provide bulk exports of water to Southern Water. This option represents a reversal of flow in the existing bulk supplies so that we would instead receive water from Southern Water via their Hampshire WRZ (the Otterbourne WSW to Source A option). At present there is uncertainty if the current pipelines could reliably provide a flow of 45 Ml/d and therefore there may be the need to replace the pipeline completely. The scheme has been costed and assessed on this basis as it reflects a worst case but would require further assessments. The pipeline would be expected to follow a similar route to the current pipelines.

It is first selected for use in 2039-40 providing 25.25 Ml/d under dry year annual average conditions, increasing to 45 Ml/d from 2046-47 onwards. Figure 97 presents the utilisation of transfer across the planning period, by return period.

This option is driven by reductions to our existing supplies in the event of high environmental destination impact. It is enabled by regional options outside of our supply area providing Southern Water with more water in Hampshire, so water is available to meet our forecast demand. The option is selected earlier in the final WRMP24 due to our greater sustainability reductions relative to the draft plan. The option is also utilised in a normal (non-drought) year, reflecting our need for water to meet sustainability reductions.

Appendix 1C details all bulk imports between Portsmouth and Southern Water, both in the baseline and in the final planning scenario. Please refer to this appendix for further information.

The South East Strategic Reservoir Option (Sesro) provides water to Thames, Southern and Affinity in the preferred plan during different conditions. We also get an indirect benefit from Sesro in the preferred plan, as we become a net importer of water from Southern, who in turn get their water from a combination of Sesro (via the Thames to Southern transfer) and the HWTWRP.

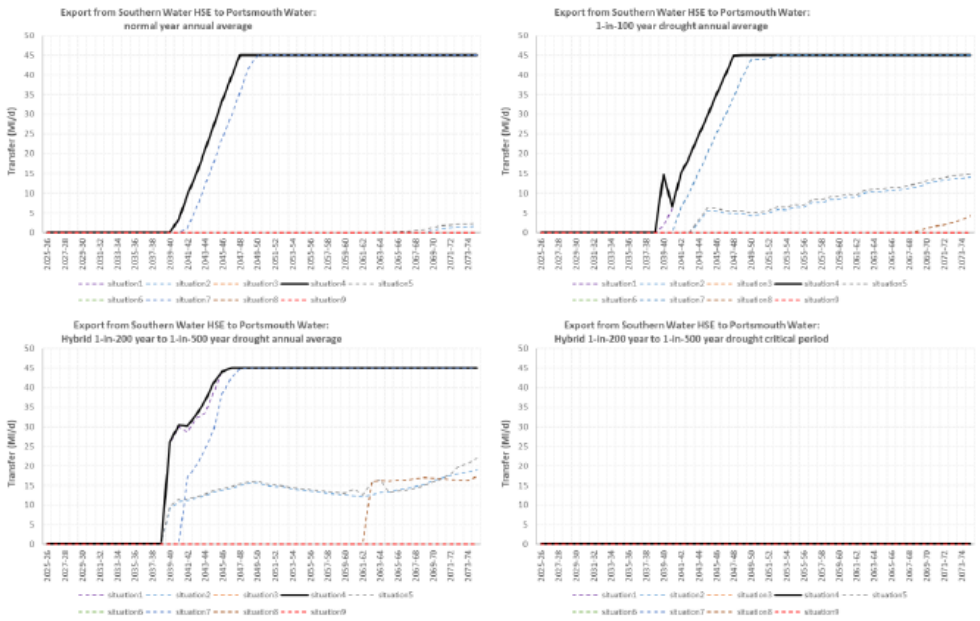


Figure 97: Utilisation of the bulk export from Southern Water / Bulk Import to Portsmouth Water across the planning period, by return period.

10.5.4 Level of Drought Resilience for Emergency Drought Orders

For the draft plan a change in the levels of service from a 1-in-200 to a 1-in-500 level of drought resilience (i.e. the point in which rota cuts are implemented) was included within the baseline supply demand balance was reflected in a change in the DO. A change from a 1-in-200 to a 1-in-500 reduces the deployable output available to us as it is a more severe drought.

For the final WRMP24 this change in the levels of service is now captured as an option, rather than the baseline following regulatory feedback. Therefore, in our baseline supply demand balance, we assume a 1-in-500 level of resilience from 2025-26 and the selection of this option effectively increases deployable output and adjusts our levels of service to a 1-in-200 until 2039-40. After which we meet a 1-in-500 level of service.

10.5.5 Additional abstraction from Havant Thicket Reservoir

As detailed in Section 6 we have a greater supply demand balance to solve in the final WRMP24, compared to the dWRMP24 due to greater sustainability reductions resulting from Environmental Destination. As a result, there are additional options selected in the Preferred Plan (situation 4) which were only selected in alternative pathways in the draft plan.

These options improve interconnectivity and treatment capacity to transfer and treat water across our supply area to utilise the water most effectively from Havant Thicket Reservoir and are selected from 2047 onwards. The preferred plan suggests the scale of this need would require up to 20 Ml/d of additional treatment works capacity at Works A (Figure 98) from the mid to late 2040s and a new 10 Ml/d WTW at the location of Service Reservoir C (Figure 99) from the early 2050s. These options would consist of pipelines and treatment capacity and are predicated on the prior construction of the proposed HWTWRP scheme for Southern Water.

To support this extra demand on Havant Thicket Reservoir, the plan suggests the reservoir could need additional recycled water to be put in the reservoir, meaning the water taken would be blended reservoir water (i.e. with contributions from rainfall, recycled water and spring water).

Portsmouth Water will seek to reduce this dependency in the next water resources management plan (WRMP29) via the consideration of new options, although the need for recycled water in a drought is expected to remain. As detailed in Section 7.8 we understand that some customers have concerns about Southern Water's HWTWRP which forms part of Southern Water's WRMP24 (please refer to Section 7.8)

Figure 98: Utilisation of Works A treatment enhancement across the planning period, by return period.

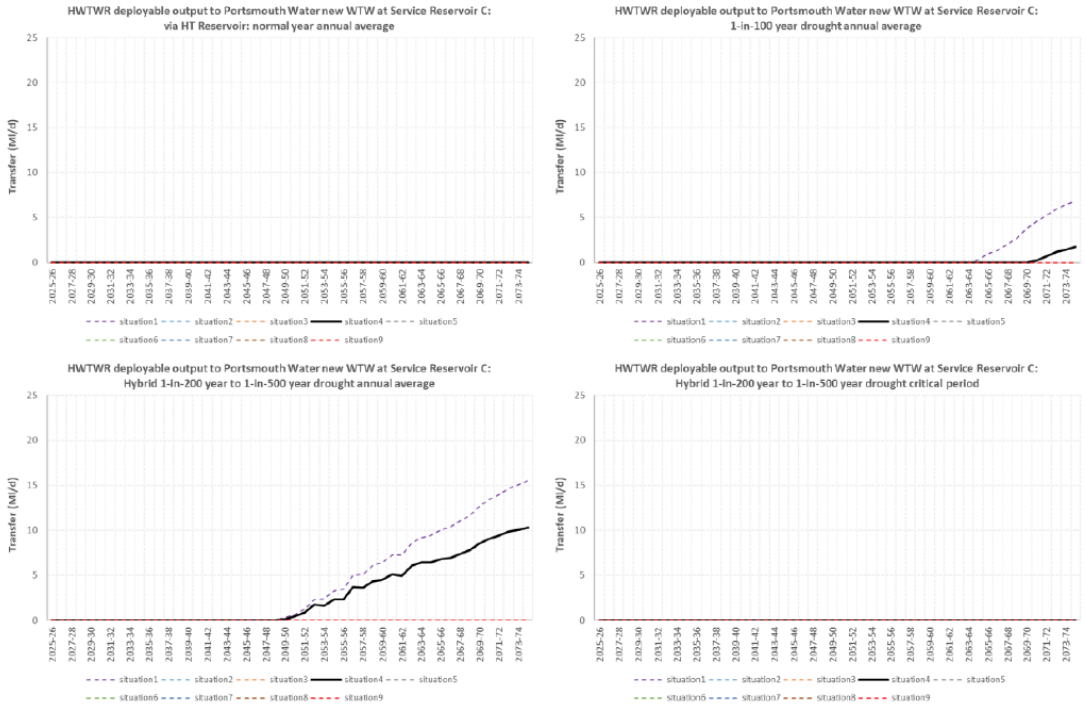


Figure 99: Utilisation of Service Reservoir C treatment enhancement across the planning period, by return period.

10.6 Options in Southern Water's preferred plan with potential to impact our customers

Our Water Resource Management Plan is highly linked to Southern Water due to our current and planned exports and options featuring in the WRMP24. Since the draft plan we have produced new supporting documentation to provide further detail on these schemes and the interlinks to Southern Water, these include:

- Appendix 1C: Details the baseline and planned imports and exports between Southern Water and Portsmouth Water over the planning period.
- Section 7.8 of this document and Appendix 7F: provide further detail on the HWTWRP proposed by Southern Water and how it interacts with our supply network. The deployable output benefit of this option is captured within our water resources zone deployable output. This water then leaves our network via exports to Southern Water. This is because the reservoir is located within our supply network.

10.7 Final planning supply demand balance

The 'final planning' supply-demand balance includes the influence of the preferred plan options.

The options selected as part of the preferred plan will balance supply and demand over the 50 year planning period while increasing resilience from a 1-in-200 year design drought until 2038–39, to a much more severe 1-in-500 year design drought from 2039–40 onwards.

Implementing the preferred options at the right time over the planning horizon should, enable us to continue meeting our planned levels of service (set out in Section 1.8) to customers throughout the planning period.

Figure 100 and Table 49 show that the preferred plan balances supply and demand throughout the planning period under dry year annual average conditions. The preferred plan is driven by the need to resolve a baseline deficit forecast under annual average conditions. Figure 101 and Table 50 show the same, but for dry year critical peak conditions, with a healthy surplus throughout the planning period.

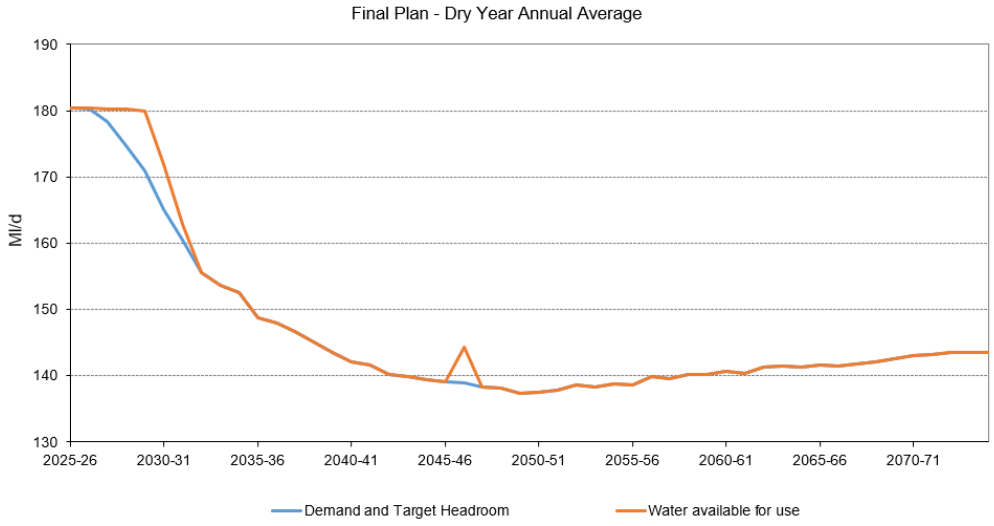


Figure 100: Final Plan supply demand balance for dry year annual average conditions

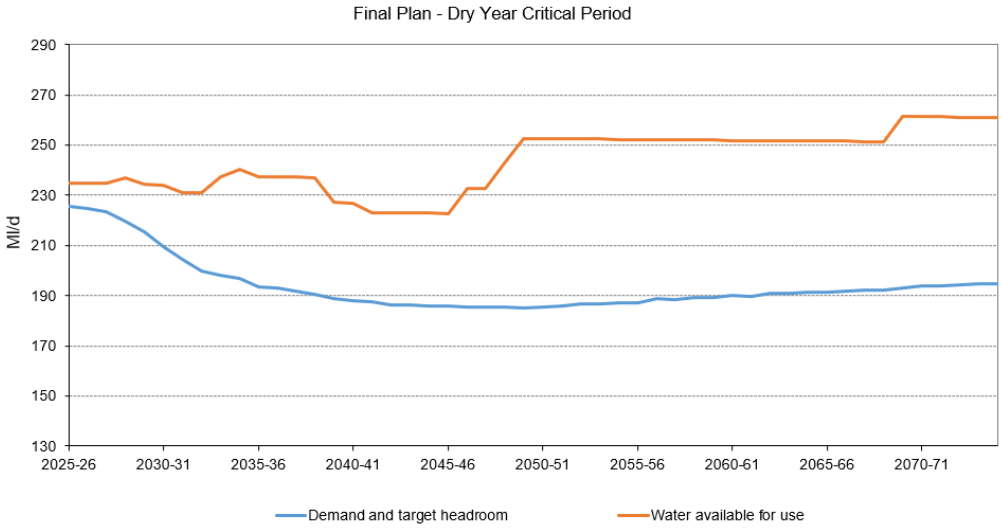


Figure 101: Final Plan supply demand balance for dry year critical period conditions

Table 49: Final plan supply demand balance for key dates over the planning period for dry year annual average conditions

	2025–26	2029–30	2034–35	2039–40	2044–45	2049–50	2059–60	2074–75
Supply in Ml/d WRP (11FP)	180.47	179.90	152.47	143.53	139.47	137.41	140.18	143.60
Demand in Ml/d WRP (45FP)	176.27	165.77	148.95	141.35	137.80	136.13	139.00	142.67
Target headroom in Ml/d (WRP 48FP)	4.21	5.15	3.52	2.18	1.68	1.28	1.18	0.93
Supply Demand Balance in Ml/d WRP (50FP)	0.00	8.99	0.00	0.00	0.00	0.00	0.00	0.00

Table 50: Final plan supply demand balance for key dates over the planning period for dry year critical peak conditions

	2025–26	2029–30	2034–35	2039–40	2044–45	2049–50	2059–60	2074–75
Supply in Ml/d WRP (11FP)	234.82	234.21	240.47	227.01	222.90	252.59	251.97	261.04
Demand in Ml/d WRP (45FP)	219.85	209.60	192.27	185.86	183.44	182.94	187.31	193.09
Target headroom in Ml/d (WRP 48FP)	5.86	5.92	4.68	3.15	2.62	2.11	2.01	1.72
Supply Demand Balance in Ml/d WRP (50FP)	9.11	18.70	43.52	38.00	36.84	67.54	62.65	66.23

10.8 Our Preferred Plan in a regional context

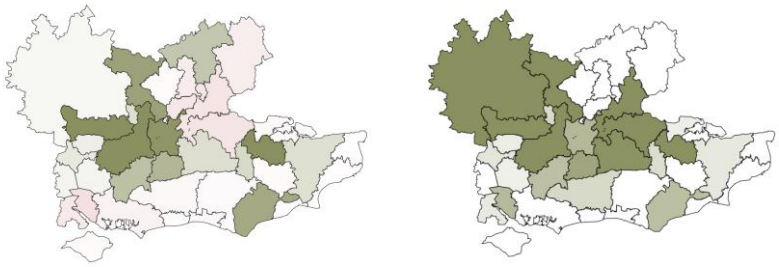
Our Preferred Plan not only supports our own future challenges, but also supports a resilient reliable water resources solution for the South East region.

The following regional maps (Figure 102) show the scale of the supply demand balance in Ml/d before and after the Preferred Plan options have been implemented. This figure was generated by WRSE.

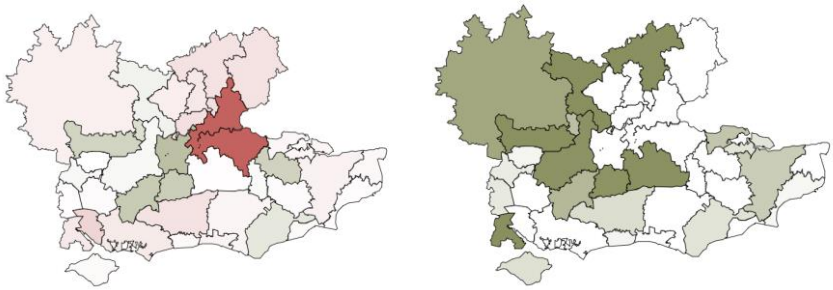
Key to the regional supply demand balance, by water resource zone in Ml/d.

-350	-300	-250	-200	-150	-100	-75	-50	-25	-10	-5	0	5	10	25
-350	-300	-250	-200	-150	-100	-75	-50	-25	-10	-5	0	5	10	25

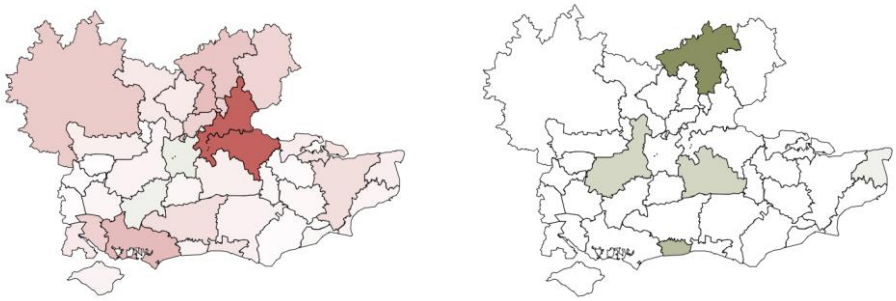
Baseline & final supply demand balance for all pathways (DYAA) for 2025–26



Baseline & final supply demand balance for the reported core pathway (DYAA) in 2035–36



Baseline & final supply demand balance for the reported core pathway (DYAA) in 2049–50



Baseline & final supply demand balance for the reported core pathway (DYAA) in 2074–75

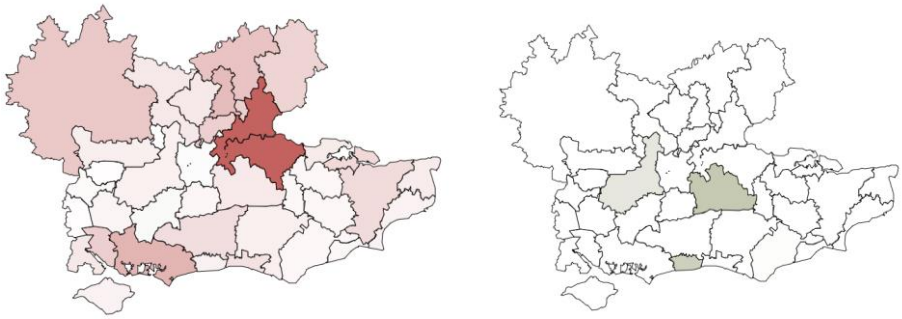


Figure 102: Regional baseline and final supply demand balance by supply zone across the South East region for DYAA

10.9 Adaptive planning and strategic alternatives in our Preferred Plan

Through the process of adaptive planning and considering strategic alternatives to our WRMP24, we considered the modelling outputs of all nine adaptive planning pathways, and a variety of optimisations to consider both what plans would look like if it was optimised on least cost, or on producing the best environmental and social metrics.

Comparing outputs for all nine adaptive pathways, our WRMP24 is resilient and largely unchanged across the variety of adaptive planning situations considered (with situation 4 reflecting our preferred plan). The implementation dates of interventions and options we need to deliver under the nine adaptive planning branches are shown in Table 51. The lack of variation of dates shows that for us, the branches do not make a significant difference to our investment needs and that our investment, particularly in the first 15 years is no regret.

Table 7 and 8 of the WRMP24 Planning Tables provide further information on costs and comparisons between various programmes and scenarios.

Table 51: A comparison of when options are triggered to resolve each of the nine adaptive planning situations

	WRSE adaptive planning situations (DYAA)								
	S1	S1	S3	S4	S5	S6	S7	S8	S9
Portsmouth Water Demand Basket 'High Plus'	2026	2026	2026	2026	2026	2026	2026	2026	2026
Network upgrade: Source O Booster	2034	2034	2034	2034	2034	2034	2034	2034	2034
Bulk import of potable water from Southern Water (Otterbourne to Source A)	2040	2040	-	2040	2040	-	2042	2063	-
Levels of service for Emergency Drought Orders (i.e. rota cuts)	2026	2026	2026	2026	2026	2026	2026	2026	2026
Drought Permit: Source S	2026	2026	2026	2026	2026	2026	2026	2026	2026
Non-Essential Use Ban (NEUB)	2026	2026	2026	2026	2026	2026	2026	2026	2026
Temporary Use Ban (TUB)	2026	2026	2026	2026	2026	2026	2026	2026	2026
Works A treatment upgrade and transfer capacity enhancements[44]	2047	-	-	2047	-	-	2040	2044	-
Service Reservoir C treatment works and transfer capacity enhancements[6]	2050	-	-	2050	-	-	-	-	-

[44] Options are linked to maximising water from Havant Thicket Reservoir

Figure 103 shows the total expenditure of the best value plan driven by each of the nine adaptive planning supply demand balance situations. The more costly pathways / situations to resolve are those defined by high climate change impact and high impact of sustainability reductions and licence capping to meet environmental destination.

Although the differences between the local authority housing and Ox-Cam housing plans didn't make any difference to the supply demand balance in our area, the distinction has impacted the most appropriate solution. There is a different cost implication for each of the two housing forecasts visible in the differences between situations two and five, and between three and six.

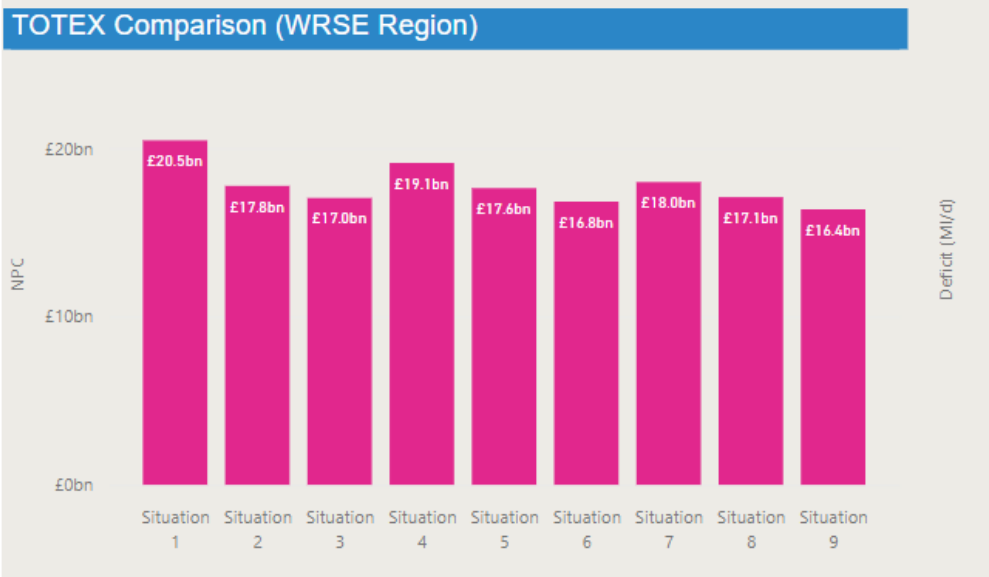


Figure 103: Total expenditure (Totex measured in Net Price Calculation) for best value plan modelling for DYAA conditions of all nine adaptive planning situations

The total expenditure for our preferred Best Value Plan reported pathway ('situation 4') is £604m, and the total expenditure for the other adaptive planning branches ranges between £419m and £612m between 2025 and 2075.

The total expenditure for the Least Cost Plan (and 'situation 4') is the same as the Best Value Plan for the first 15 years of the plan. Further information on the cost of alternative plans is provided in the supporting WRMP24 planning tables.

For our rdWRMP24 we estimated that our 50-year preferred Best Value Plan will add around £5.20 per year on average to bills in 2025/26, rising to £15.42 in 2029/30, increasing to £40.90 by 2050. This is compared to our current average bill of £117 per year. These figures are subject to change because of the ongoing PR24 process.

The bill impacts presented in the rdWRMP24 were calculated based on our Company financial model and decisions on Weighted Average Cost of Capital (WACC) and depreciation. We selected Ofwat's early view of the WACC plus a small company premium on the cost of debt.

10.9.1 WRMP24 Ofwat Core Pathway and PR24 Long Term Delivery Strategy

Our preferred plan for WRMP24 reflects reported pathway (situation 4). However, our business plan Long Term Delivery Strategy (LTDS) also requires us to consider our WRMP24 Ofwat core pathway, which is represented by Situation 8 (as in Table 51).

Situation 8 reflects a benign future of climate change, demand and abstraction reduction. Therefore, investment under this future would reflect no regret investment. As detailed in Table 51 our investment between Situation 4 (our preferred central scenario) and Situation 8 are largely the same until post 2040, indicating that in the short term there is minimal risk of over investment. For all our future scenarios, investment in demand management measures, and smart metering in particular, is key.

For our PR24 preparations we developed our LTDS which has been published in our PR24 Business Plan. Whilst our WRMP24 Ofwat core pathway looks at one future and is a key focus for our LTDS, our LTDS reviews multiple potential futures based on different combinations of high and low Ofwat reference scenarios.

The WRMP24 is only one component of the LTDS with raw water quality, non infrastructure improvements, cyber security and lead pipes all core components.

The LTDS is our framework, ensuring we are equipped to navigate the dynamic water industry landscape over the next 25 years. By clearly defining our ambitions, strategies, rationales, foundations, and board assurance, we aim to build a sustainable and adaptable future for our customers and stakeholders. Our core pathway is created by combining all no and low regret investment options that have been chosen to either keep future options open or are required to be undertaken regardless of circumstance.

The WRMP and LTDS have been developed using consistent data sets. The costs of the Ofwat Core Programme (WRMP Situation 8) and the Preferred (most likely) programme (WRMP Situation 4) can be found in the WRMP24 planning tables (Table 7 and 8). Data was also provided for 'LTDS Extra Plans' in the rdWRMP24 tables that explore different combinations of Ofwat reference scenarios.

10.10 SEA Assessment Findings

The SEA and other assessments carried out during the development of this WRMP24 has been thorough and comprehensive. Assessment was made of an initial long list of sites and environmental issues were considered through all stages of short listing and option development. This was at both a regional level and at a more local level that considered issues in light of the environmental context of our supply area. Two SEA teams (one Regional and one specific to the Company) have been involved and have acted independently of each other, though liaison has been maintained and results of assessments shared. These teams have also liaised closely with our WRMP24 team and have challenged that team when appropriate.

As would be expected from any WRMP, there are environmental implications of the implementation of the Preferred draft plan and some of these are adverse, with adverse effects anticipated resulting from the implementation of a number of options. Nevertheless, it is considered that such adverse effects can be mitigated to an acceptable level and appropriate monitoring can be undertaken to ensure that effects are as anticipated. Remedial action can be taken if unexpected effects arise or if it is shown that option implementation is causing unanticipated effect. The results of monitoring will also be used to help inform future iterations of the WRMP and can also be used to help inform the design and further assessment of individual schemes derived from WRMP24.

Overall, it is considered that the WRMP24 represents a well balanced approach in terms of environmental performance across the range of potential key effects delineated in the assessment framework. This conclusion should be viewed alongside the WRSE cumulative environmental assessment of the options.

Any development that we undertake, whether through the planning system or as permitted development, will be undertaken in an environmentally responsible and sustainable manor.

Planning requirements, such as the development of Havant Thicket Reservoir, do require this approach and we will also aim for a minimum of 10% Biodiversity Net Gain (BNG). There will be a commitment for having clear SMART aims and objectives for every project.

10.11 Adaptive Plan Monitoring Plan

Since the dWRMP24 we have produced a new monitoring plan to detail what metrics we will monitor to inform which adaptive pathway is emerging and what interventions are needed. This will primarily be delivered via our annual reporting of the water balance and undertaking forecasts of planned actions. This would be supported via our collaboration with WRSE and neighbouring companies, such as Southern Water. Please refer to Appendix 10A for further information. The monitoring plan has also been informed by the Sensitivity Testing undertaken (as detailed in Section 9).

10.12 Carbon

Appendix 7E is the carbon appendix. It details the baseline carbon and carbon assessment undertaken for the Preferred Plan. This is summarised in Table 52 below. As detailed in Appendix 7E this is considered to be worst case as the demand options do not account for the reduction in demand resulting from their implementation (and less water into supply) and secondly the gradually decarbonisation of the economy. Our supply options start in 2034 onwards and during this time the economy will gradually transition to lower carbon materials and technology. In addition, lower carbon solutions would be embedded into the design and delivery of schemes.

Table 52: Carbon resulting from the implementation of the Preferred Plan

Option Type	Embodied carbon emissions (tCO2 equivalent)	Operational carbon emissions under maximum utilisation scenario (tCO2 equivalent)	Average operational carbon emissions (tCO2 equivalent)
Bulk Imports	10,052	490	468
Demand Reductions	34,193	330	330
Network Enhancements	449	8	4
Supply Schemes	17,430	1,818,604	1,382,296
Demand Reductions (drought permits)	0	0	0
Supply Scheme (drought permits)	100	7	2
Leakage Reductions	40,509	0	0
Total	**102,733**	**1,819,439**	**1,383,100**
**Note this assessment excludes options linked to Southern Water's abstraction from Havant Thicket Reservoir as that would be captured in Southern Water WRMP24.*			

10.13 Sustainable Abstraction

A key aspect of our plan is sustainable abstraction and the potential licence and deployable output reductions proposed. These are a key driver for investment in this plan. Over AMP8 and into AMP9 we will be undertaking a range of detailed investigations and option appraisal

to further quantify the scale of these potential reductions and which supply and nature and catchment based solutions are needed to support their implementation. Our approach to sustainable abstraction is detailed within Appendix 5B 'Investigating and Achieving Sustainable Abstraction'.

11 QUALITY ASSURANCE, AND OUR BOARD ASSURANCE STATEMENT

We developed elements of our WRMP24 in-house. The Board also approved the appointment of expert third parties to undertake preparation of certain parts of the WRMP and approved the development of other parts of the WRMP to be carried out in regional collaboration. This is shown earlier in Figure 29 and Figure 87.

The data input into the WRMP was checked and reviewed internally with additional peer reviews and assurance points at key points to ensure the quality of work produced and its compliance with the WRPG. Figure 29 shows the aspects of our WRMP24 that have been audited and assured.

The Board considered assurance reports from Jacobs, our Technical Assurance provider on the WRMP24. The reports checked:

- that we have met our obligations in developing our plan.
- that our draft plan incorporated the long-term government requirements for leakage and demand reduction.
- that our draft plan aligns with the WRSE regional plan and that it has been developed in accordance with the national framework and relevant guidance and policy.
- that the WRMP and PR24 planning assumptions are consistent.

These assurance reports are included as Appendix 11A to this rdWRMP24.

The Board also considered the views of the WRMP24 Steering Group. This was a group of Key internal stakeholders from across the business who met monthly throughout the development of the WRMP. The purpose of the Steering group is as follows:

- To ensure the visibility and buy-in of the WRMP24 development and decision-making process to key representatives within our company
- As a quality assurance measure
- To provide robust challenge to the WRMP24 process
- To review progress, issues and key programme risks
- To approve and document key business decisions
- To escalate specific decisions to the Executive and Board where appropriate
- To provide confidence to the Executive and Board when it comes to their sign off of the WRMP24
- To provide the linkages between the WRMP24 process and wider business functions, including Business Planning for PR24 and net zero - so that the outputs of WRMP24 are fit for purpose going forward into the Business Plan.

The WRMP24 Steering Group terms of reference is included as Appendix 11B.

Board Assurance Statement

The Board have been actively engaged in the development of this final Water Resource management Plan (WRMP) through;

- Setting the company's vision and strategy.
- Regular review sessions with individual Board members and the full Board at key development stages.

The Board has put in place both internal and third-party technical assurance to ensure the quality of this Water Resource Management Plan (WRMP).

Having reviewed the WRMP and considered the assurance reports from Jacobs, our Technical Assurance provider, the Portsmouth Water Board can confirm:

- we have met our obligations in developing our plan.
- our plan incorporates the long-term Government requirements for leakage and demand reduction.
- our plan aligns with the WRSE regional plan and that it has been developed in accordance with the national framework and relevant guidance and policy.
- that the assumptions in the WRMP are consistent with the PR24 planning assumptions.
- our plan is the best value plan for managing and developing our water resources in order to allow us to continue to meet our obligations to supply water and protect the environment.
- the plan is based on sound and robust evidence, including that relating to costs.

This plan addresses the comments received through the consultation, and we endorse this plan as the most cost-effective and sustainable long-term solution, making a major contribution to resilient water supplies in the South East for the future.

12 REFERENCES

Affinity Water, 2020. Water Resources Management Plan. 2020-2080.
www.affinitywater.co.uk/docs/Affinity_Water_Final_WRMP19_April_2020.pdf
[Accessed 27 July 2022]

Artesia Consulting, 2019, Pathways to long-term PCC reduction
www.water.org.uk/wp-content/uploads/2019/12/Water-UK-Research-on-reducing-water-use.pdf
[Accessed 3 October 2022]

Defra, October 2021, 25 year Environment Plan
https://www.gov.uk/government/publications/25-year-environment-plan
[Accessed 3 October 2022]

Edge Analytics, July 2020, WRSE population and property forecast methodology,
ww.wrse.org.uk/media/isrfvms0/wrse_file_1346_wrse-population-property-forecast-methodology-draft-report.pdf
[Accessed 3 October 2022]

Environment Agency and Natural Resources Wales, 2013, Water stressed areas - final classification.
https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/244333/water-stressed-classification-2013.pdf
[Accessed 27 July 2022].

Environment Agency, 2018, The state of the Environment: Water Quality
State of the environment - GOV.UK (www.gov.uk)
[Accessed 3 October 2022]

Environment Agency, 2021, Water stressed areas - final classification 2021. Version: 1.0.
https://view.officeapps.live.com/op/view.aspx?src=https%3A%2F%2Fassets.publishing.service.gov.uk%2Fgovernment%2Fuploads%2Fsystem%2Fuploads%2Fattachment_data%2Ffile%2F998237%2FWater_stressed_areas___final_classification_2021.odt&wdOrigin=BROWSELINK
[Accessed 27 July 2022]

Environment Agency, March 2020. Meeting our future water needs: a national framework for water resources (publishing.service.gov.uk)
https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/872759/National_Framework_for_water_resources_main_report.pdf
[Accessed 3 October 2022]

Environment Agency, October 2015, Water supply and resilience and infrastructure -
https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/504682/ea-analysis-water-sector.pdf
[Accessed 3 October 2022]

Environment Agency, Ofwat and Natural Resources Wales, July 2022, The Water Resources Planning Guideline
https://www.gov.uk/government/publications/water-resources-planning-guideline
[Accessed 3 October 2022]

Met Office. UK Climate Projections (UKCP)
www.metoffice.gov.uk/research/approach/collaboration/ukcp/index
[Accessed 3 October 2022]

Ofwat, 2021. The regulatory and commercial framework for strategic water resource solutions - a consultation.
www.ofwat.gov.uk/wp-content/uploads/2021/12/RAPID-Autumn-2021-condoc.pdf
[Accessed 24 August 2022].

Ofwat, April 2022, PR24 and beyond: Final guidance on long-term delivery strategies
www.ofwat.gov.uk/wp-content/uploads/2022/04/PR24-and-beyond-Final-guidance-on-long-term-delivery-strategies_Pr24.pdf
[Accessed 3 October 2022]

Ofwat, May 2022, Looking to the long term
www.ofwat.gov.uk/looking-to-the-long-term/
[Accessed 3 October 2022]

Ofwat, November 2021, Ofwat's expectations for strategic planning frameworks at PR24.
www.ofwat.gov.uk/wp-content/uploads/2021/11/Ofwats-expectations-for-strategic-planning-frameworks-at-PR24_Letter.pdf
[Accessed 3 October 2022]

National Infrastructure Commission, 2018, Preparing for a drier future: England's water infrastructure needs
https://nic.org.uk/studies-reports/national-infrastructure-assessment/national-infrastructure-assessment-1/preparing-for-a-drier-future/#
[Accessed 3 October 2022]

Portsmouth Water, 2022, Excellence in water. Always. Our 25-year vision
https://www.portsmouthwater.co.uk/wp-content/uploads/2022/08/PW-Vision-Brochure-Interactive.v2.pdf
[Accessed 3 October 2022]

Portsmouth Water, 2021. WATER RESOURCES MANAGEMENT PLAN. ANNUAL REVIEW 2021.
www.portsmouthwater.co.uk/wp-content/uploads/2021/07/Portsmouth-Water-WRMP-Annual-Review-June-2021.pdf
[Accessed 27 July 2022].

South East Water, 2020. Water resource management plan. annual review and data return.
www.southeastwater.co.uk/Publications/Water+resources+management+plan+2019/south-east-water-annual-wrmp-review-report-2020-final.pdf
[Accessed 27 July 2022].

Southern Water, 2021. Southern Water's Water Resources Management Plan 2019. Annual Review 2020-21.
www.southernwater.co.uk/media/5647/southern-water-wrmp19-ar-2021.pdf
[Accessed 27 July 2022].

Sutton and East Surrey Water (SES), 2021. Water Resource Management Plan. Annual Performance Report 2021.
www.seswater.co.uk/-/media/files/seswater/about-us/publications/annual-report-2021/ses-water-annual-performance-report-2021.pdf
[Accessed 27 July 2022].

Thames Water, 2021. Water Resources Management Plan. Annual Review 2021-22.
www.thameswater.co.uk/media-library/home/about-us/regulation/water-resources/annual-review.pdf
[Accessed 27 July 2022].

Tomlinson, J.E., Arnott, J.H. and Harou, J.J., 2020. A water resource simulator in Python. Environmental Modelling & Software.
https://doi.org/10.1016/j.envsoft.2020.104635
[Accessed 3 October 2022]

UKWIR, 2013, 'Impact of Climate Change on Water Demand Project'

UKWIR, 2016, WRMP19 Methods -Household Consumption Forecasting

UKWIR, 2017, Consistency of Reporting Performance Measures: Reporting Guidance
Water UK, 2016, Water resources long term planning framework (2015-2065)
Water resources long term planning | Water UK
[Accessed 3 October 2022]

WRc, 2012, Compendium of Micro-Components

WRc, 2020, Dynamic Demand Modelling for WRSE
www.wrse.org.uk/media/yfhnaiqc/wrse_file_1342_wrse-dynamic-demand-modelling-report.pdf
[Accessed 3 October 2022]

Reports hosted on the WRSE website
www.wrse.org.uk/library